Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

Semi coaches built by Weymann's Ltd. for The Potteries Motor Traction Company Limited have seat backs and side panels made from red 'Darvic' and lining underneath luggage racks from white 'Darvic' p.v.c. sheet.

Red and white 'Darvic' add brightness to coach journeys

SEAT BACKS and side panels beneath windows—red 'Darvic' p.v.c. sheet; lining underneath luggage racks—white 'Darvic': this is a delightfully gay coach to ride in. Easily shaped 'Darvic' is the ideal material for coach interiors. It is so easy to clean. It will not rust or corrode and has dimensional stability in atmospheres of varying humidity. 'Darvic' is hygienic, too, and is resistant to staining by tobacco fumes.

Even in thin sheets, 'Darvic' combines toughness with light weight and high impact strength. It is sold in a wide range of attractive colours, including multi-colour laminates.

'DARVIC'

'Darvic' is the registered trade mark for the rigid p.v.c. sheet made by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

ICI

PD.49

Erinoid

Brush handles moulded in
Erinoid Cellulose Acetate Powders
by J. E. Snow Ltd., Sheffield, for
Kleen-e-ze Brush Co. Ltd.

ERINOID LIMITED STROUD GLOUCESTERSHIRE

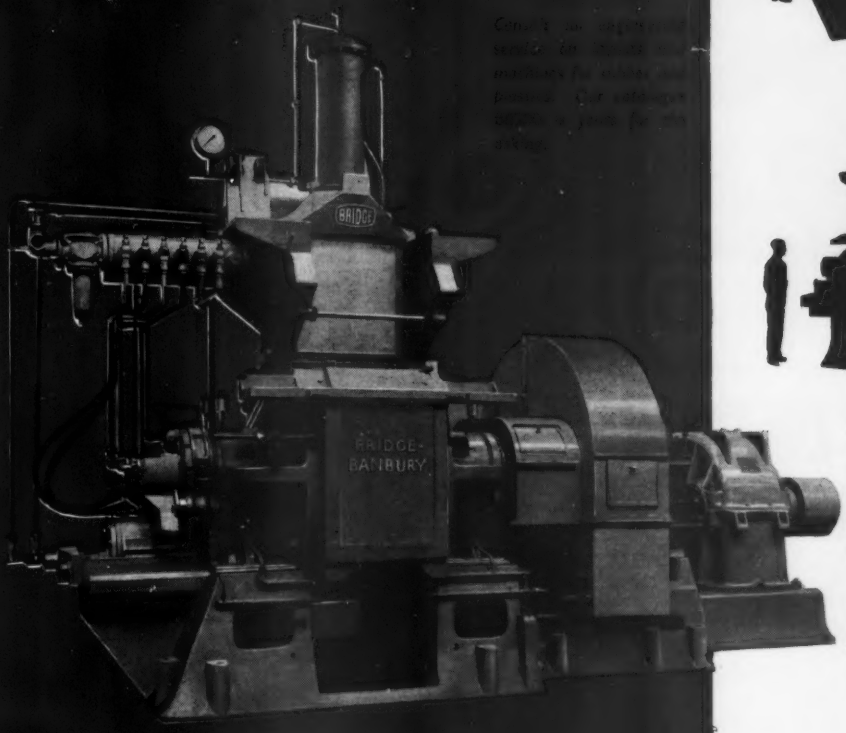
Bridge-Banbury MIXERS

Produce the

Higher Output more quickly, more efficiently and guarantee a more uniform and

Higher Quality mix. By minimising manual operating they produce at

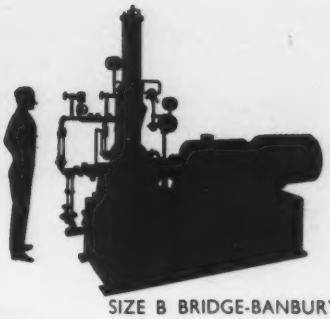
Lowest Costs with the maximum degree of dependability and safety.



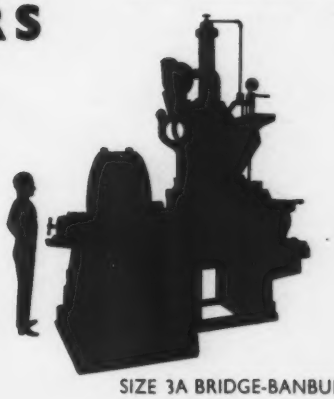
SIZE 11 BRIDGE-BANBURY

BRIDGE-BANBURY *Automation*

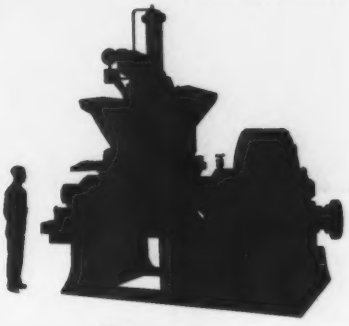
DAVID BRIDGE & COMPANY LIMITED



SIZE B BRIDGE-BANBURY



SIZE 3A BRIDGE-BANBURY



SIZE 9 BRIDGE-BANBURY

SIZE 27 BRIDGE-BANBURY

for

ROTARY SLUSH MOULDING

VINATEX
PVC PASTES

GRADE RC.

Specially formulated for the mass production of PVC mouldings by the Rotary Slush Moulding Process. Available in a wide range of colours and hardnesses.

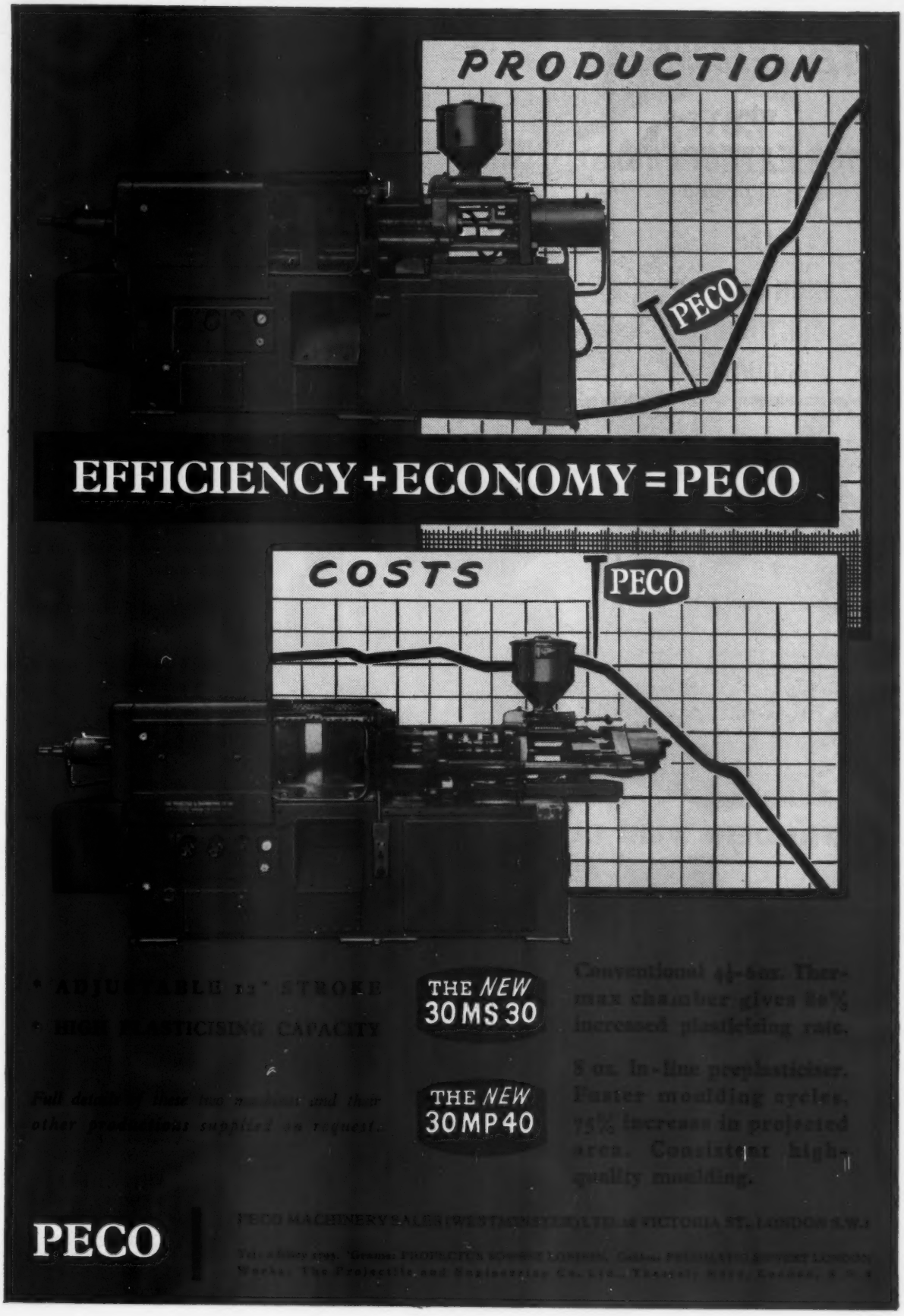
Samples and further particulars will be gladly supplied on application to our Technical Sales Department.

VINATEX PVC Pastes are also supplied for Coating, Slush Moulding, Dip Moulding, and the Dip Coating of wire articles.

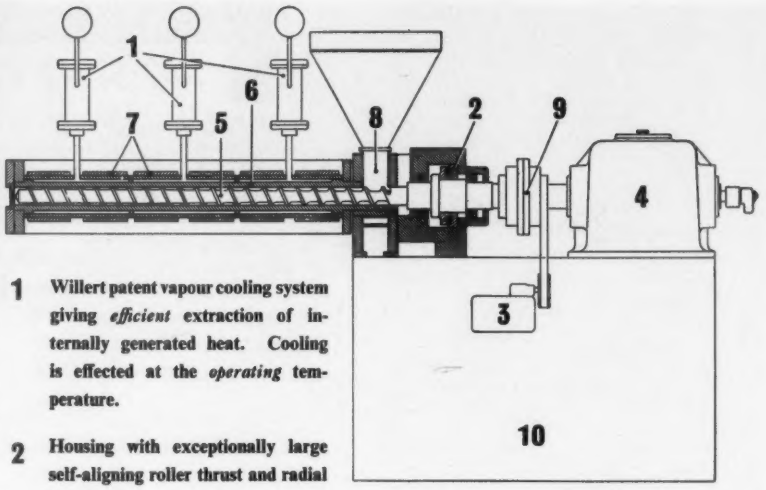
VINATEX LTD., Devonshire Road, Carshalton, Surrey

V43

Tel.: Wallington 9282 (PBX)


PRODUCTION
PECO
EFFICIENCY + ECONOMY = PECO
COSTS
PECO
THE NEW
30 MS 30
THE NEW
30 MP 40
PECO

TEN REASONS why BONE EXTRUDERS are *supreme* for HIGH OUTPUT CONTINUOUS PRODUCTION



1 Willert patent vapour cooling system giving *efficient* extraction of internally generated heat. Cooling is effected at the *operating* temperature.

2 Housing with exceptionally large self-aligning roller thrust and radial bearings.

3 Thrust bearing lubricating pump.

4 High efficiency double reduction double helical gearbox.

5 High tensile alloy steel extrusion screw, stellite tipped.

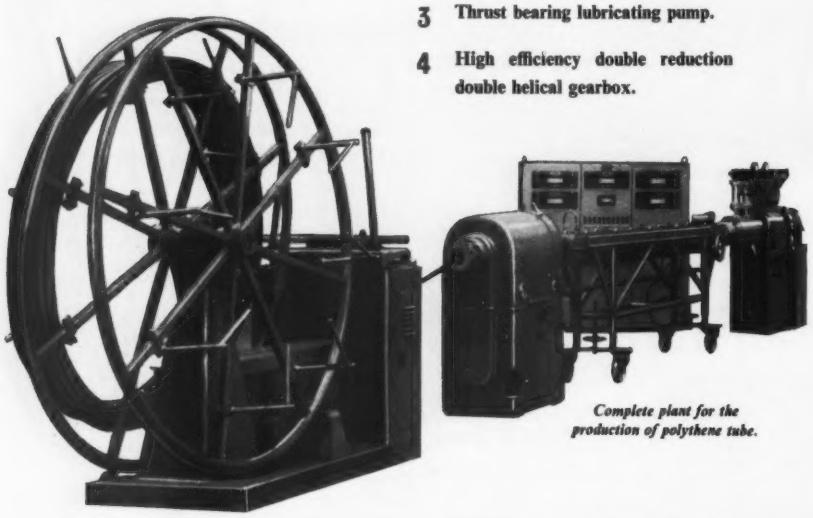
6 X-alloy liner.

7 Ceramic insulated heater bands.

8 Water cooled feed-box with large feed opening.

9 All steel flexible coupling prevents thrust loading on gearbox.

10 Heavy steel bedplate designed to resist torsional loads.



Complete plant for the production of polythene tube.

We are associated with
FRANK W. EGAN & COMPANY
NEW JERSEY, U.S.A.

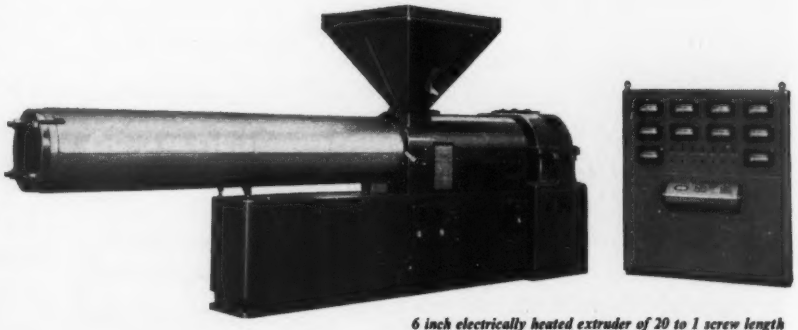
EXTRUDERS AND PLANT FOR THE PLASTICS INDUSTRY

We make extruders up to 8 inches diameter and 24 to 1 screw length to diameter ratio, also complete plant for extrusion, coating and laminating, flat and tubular film, tubes and pipe, sheet sections and monofilaments.

The advice of our technical staff and our laboratory facilities are available to help with your problems.

Telephone—**Perivale 9555/7**

Telegrams & Cables—**Bonebrolim, Wembley**



6 inch electrically heated extruder of 20 to 1 screw length to diameter ratio, with electronic proportioning controller panel, and operating desk.

BONE BROTHERS LTD

MANOR FARM ROAD, ALPERTON, WEMBLEY, MIDDLESEX

in PLASTICS
The high tinting strength of
TITANIUM OXIDE gives brightest colours
and opacity with minimum loading
British Titan Products
brighten products
B T P
TITANIUM
PIGMENTS
BRITISH TITAN PRODUCTS COMPANY LIMITED 10 Stratton Street London W.1

PLASTICS . . .
the newest material in one of the World's oldest crafts

WINDSOR INJECTION MOULDING MACHINES

Among the many important industries using plastics in present day production are footwear manufacturers throughout the world. Linked with this notable achievement are Windsor Injection Moulding Machines, advanced in design, and precision built of highest grade materials, these Windsor machines can be depended upon for long service and quality of production with minimum attention.

★ *Descriptive literature of the full Windsor range is available on request.*

THE WINDSOR RANGE INCLUDES INJECTION MOULDING MACHINES in capacities of from 1 to 200 ounces AND EXTRUSION MACHINES with outputs up to 500lbs. per hour.

R.H. Windsor LTD

Head Office and Works:
LEATHERHEAD ROAD, CHESSINGTON, SURREY.
Tel: Epsom 5631 (PBX). Grams: WINPLAS, Chessington, Surrey.
London Office: 49 Upper Brook Street, W.1. Tel: Mayfair 9020.

ELCO PLASTICS

LIMITED

PLASTIC MOULDINGS

S R B P TUBING

EXTRUSIONS

MODERN TOOL ROOM
AND
DESIGN STAFF
ON
PREMISES

DESBOROUGH PARK ROAD

HIGH WYCOMBE BUCKS

Tel. No. High Wycombe 3554 - 1921 - 1922

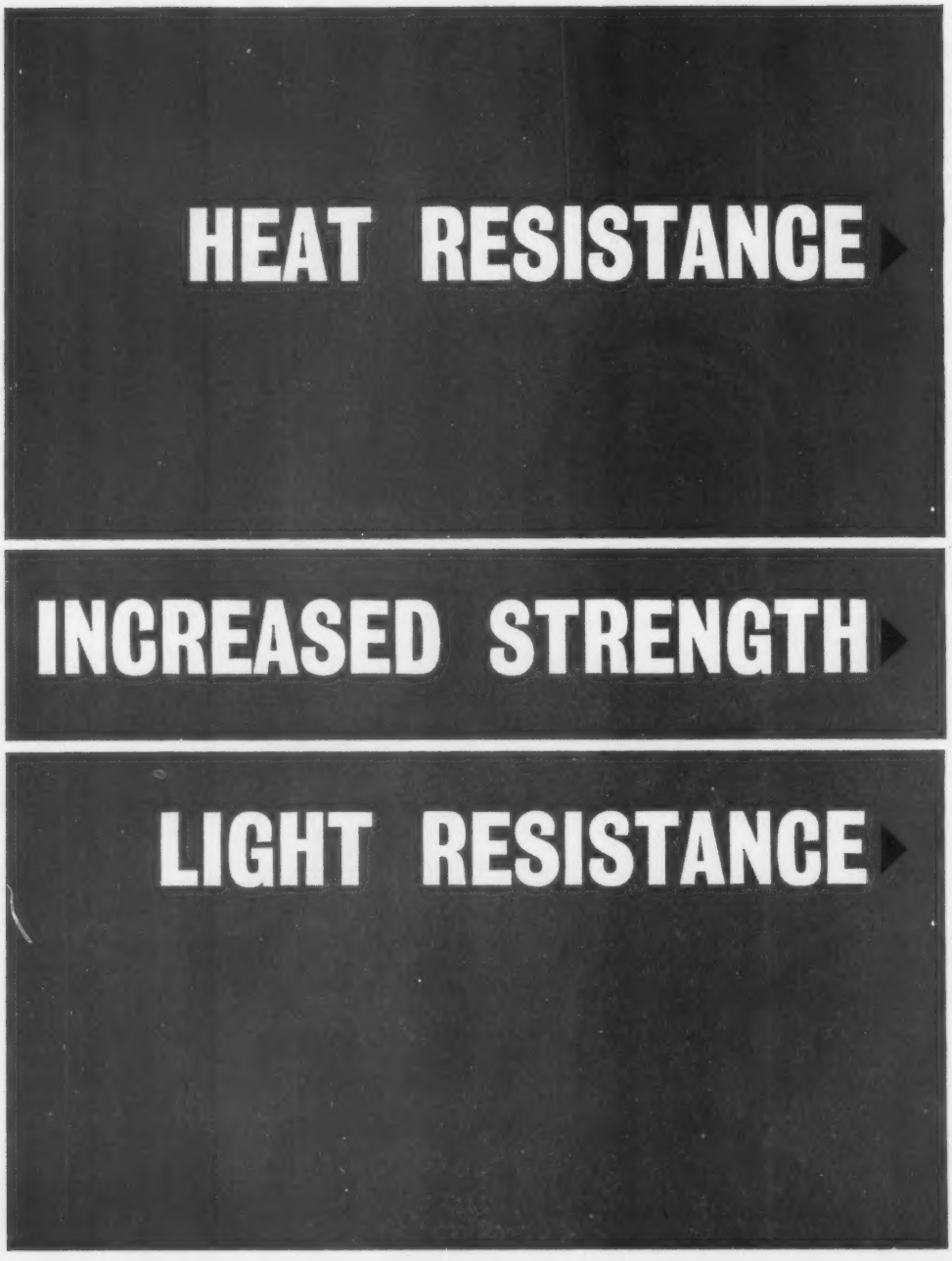
TUBE LAMINATION & ENGINEERING

LIMITED

A.I.D. APPROVAL No. 69/40 I.F.V. APPROVAL No. AV0078/53/D A.R.E. APPROVAL No. AV/4005/55

The SPECIAL grades of

The range of Erinoid polystyrene moulding powders provides materials which meet the exacting requirements of today's most varied applications and manipulation techniques. In this range there is a group of *special* grades giving three outstanding qualities—heat resistance, increased strength (with transparency) and light resistance.



Erinoid polystyrene

Four grades are available. Each has a softening point of 100°–103°C. and a permanent heat distortion resistance of 85°C.

HS This is the 'general purpose' heat resistant grade.

2CL/HS A heat resistant, high molecular weight polystyrene with an overall 50% increase in strength. Available in all colours, including crystal clear—*at no extra cost.*

CP.20/HS A heat resistant, high-impact polystyrene with exceptional impact and flexural strength. Its outstanding feature is the very high gloss surface finish obtainable on mouldings.

ACN/HS Styrene acrylonitrile copolymer which has a strength figure 50–100% higher than general purpose polystyrene. It has good resistance to abrasion and crazing. ACN/HS has excellent electrical properties and metal inserts can be moulded in. It is resistant to attack by petrol, white spirit, fruit juices, acids, alkalies, fats, inks and disinfectants. Tea and coffee do not stain ACN/HS.

TYPICAL APPLICATIONS

Electrical coil formers.
Foil for capacitor insulation.

Electrical components.
High-quality monofilament.
Disposable packs (e.g. for jam, allowing hot-filling).

Vacuum flask cups.
Electric razor housings.
Jelly trays.
Motor car & radio components.

Monofilament.
Oil filter bowls.
Household utensils.
Canteen-ware.
Motor car components.
Office machinery.
Vacuum cleaner components.

2CL 2CL/HS High molecular weight polystyrene, grade 2CL gives 50% increase in strength—*at no extra cost.* This grade is ideal for mouldings which have to withstand flexing, vibration or shock. This increased toughness is achieved without impairing the crystal clarity of the material. It is also available in a heat resistant grade 2CL/HS —see above.

Bathroom and kitchen fittings.
Moulded packs.
Radio cabinets.
Monofilaments.

Colour formulations 3L121 and 3L133 Ordinary grades of polystyrene, particularly in crystal and opal shades, are liable to yellow on exposure to light after about eight months' use. To overcome this, four of the Erinoid grades have been light-stabilised. Erinoid light-stabilised grades resist yellowing for up to 3½ years. In addition to allowing maximum light transmission these grades effectively diffuse the light. The four Erinoid grades available in light-stabilised form are: KLP, 2CL, 2CL/HS and HS.

Lighting fittings, including extruded sections and moulded diffuser screens.

THESE SPECIAL GRADES ARE ALL AVAILABLE AS MOULDING POWDER, SHEET AND EXTRUDED SECTIONS

Erinoid polystyrene is manufactured by

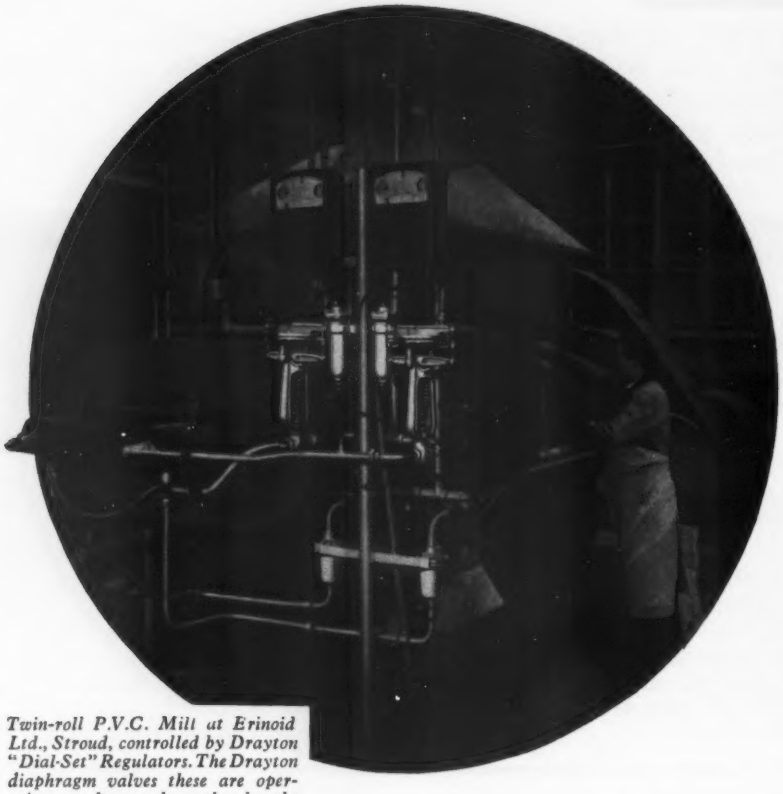
STYRENE PRODUCTS LIMITED

Full information, samples, prices etc., on application to

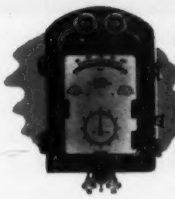
ERINOID LIMITED · STROUD · GLOUCESTERSHIRE

Telephone: Stroud 810

CALL IN DRAYTON*



Twin-roll P.V.C. Mill at Erinoid Ltd., Stroud, controlled by Drayton "Dial-Set" Regulators. The Drayton diaphragm valves these are operating can be seen beneath, also the Drayton-Armstrong traps on the steam heated rolls.



Air operated controllers with or without recording feature.

Air or water operated controllers: expansion stem type.

On-off electric control. Available with a wide range of thermostatic switches.

Self-operated controllers, for calorifiers, tanks, etc.

Proportioning electric control with electrical or capillary tube transmission.

Drayton make an entire range of regulators and automatic control equipment applicable to virtually every kind of industrial processing and of the highest reliability. These include self-operated types, air and water-operated regulators and electrical systems with the complementary control apparatus for each particular application. More than that, we can advise from the widest possible experience on what type of control system will prove most suitable for the requirements. Drayton Service ranges from the designing and installation of complete instrumentation schemes to the supply of single regulators for a particular process. Send us details of your problem or write for the Drayton Catalogue covering our manufacturing range.

*and get things under control

AC29

Write to Dept. P.

The Drayton Regulator & Instrument Co. Ltd., West Drayton, Middlesex. *Tel.: West Drayton 4012*

SAROY

• THE HIGH IMPACT POLYSTYRENE SHEET

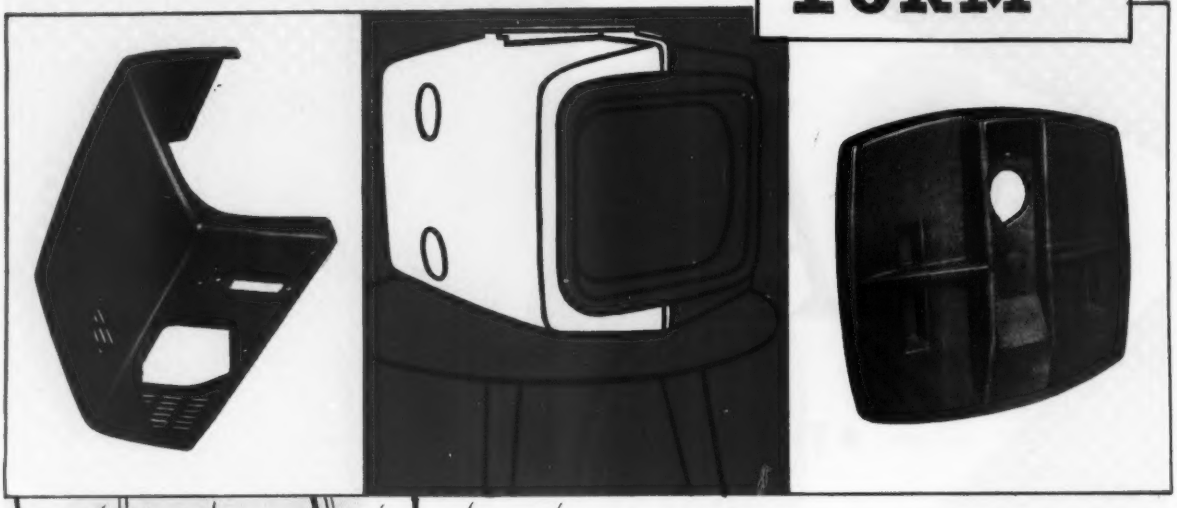
No. 4 in a series of advertisements to keep you informed of SARO achievements

Saroy is being increasingly used in a number of countries for the manufacture of well designed toys. This photograph shows a yacht thermo formed from Saroy (the pride and joy of its young owner). Formed by Plateplast I/S, Fredrikstad, Norway.

The Plastics Division of
SARO LAMINATED WOOD PRODUCTS LTD.,
ISLE OF WIGHT, ENGLAND
TELEPHONE : COWES 704/708

PROGRESS in Plastics

FIBRE FORM



STRENGTH with LIGHTNESS and LOW COST

Fibre Form Ltd. are the pioneers in the development of a new and unique material based on the combination of strong cellulose fibre with synthetic resins. The resin-bonded fibre is preformed to shape and then moulded under heat and pressure to close dimensional tolerances.

The choice of materials and methods of manufacture ensure high strength, lightness and excellent styling possibilities: the ingenious mass-production methods keep the prices low.

The television cabinet halves and backs moulded for Murphy Radio Limited and the suitcase shells moulded for Parker Wakeling & Co., Ltd., illustrate the functional beauty achieved in competitive markets. Attractive finishes are achieved by stove-enamelling and, in the case of the suitcase, by leathercloth covering.

Suggested applications would include:—

Typewriter and office machine covers
Moulded chairs and table tops
Motor car facia panels
Fluorescent tube covers
Clock cases

Can we improve YOUR product and reduce YOUR costs?

FIBRE FORM

FIBRE FORM LTD

GARRATT MILLS, TREWINT STREET, EARLSFIELD, LONDON S.W.18. Tel: WIM 3946
and LOWER GORNAL, Nr. DUDLEY, WORCS. Tel: Sedgley 3486

You can rely on—

STEARINES

If you need Stearines free from impurities and of good colour and odour—contact Price's. The basic raw materials they blend are carefully selected and all specifications are rigidly controlled by qualified chemists with a century of tradition behind them. You can be sure that Price's Stearines will meet your most exacting requirements just as you can be sure of complete and regular deliveries.

PRICE'S

OLEINES · STEARINES

PS 52-8058-100

now from SHELL comes Carlona

Ziegler process high-density polyethylene

Compared with earlier polyethylene, Carlona is much stronger, more rigid, more heat resistant, and more resistant to chemicals and solvents.

And it is now being made in the United Kingdom in production quantities.

Carlona's enhanced qualities are such that this important new plastics material is assured of very wide acceptance and application.

The various grades have been developed to meet the needs of fabricators using injection moulding, extrusion and other thermoplastic techniques. Sample and commercial quantities can now be supplied.

Further information from

SHELL CHEMICAL COMPANY LIMITED

In association with Petrochemicals Limited and Styrene Products Limited

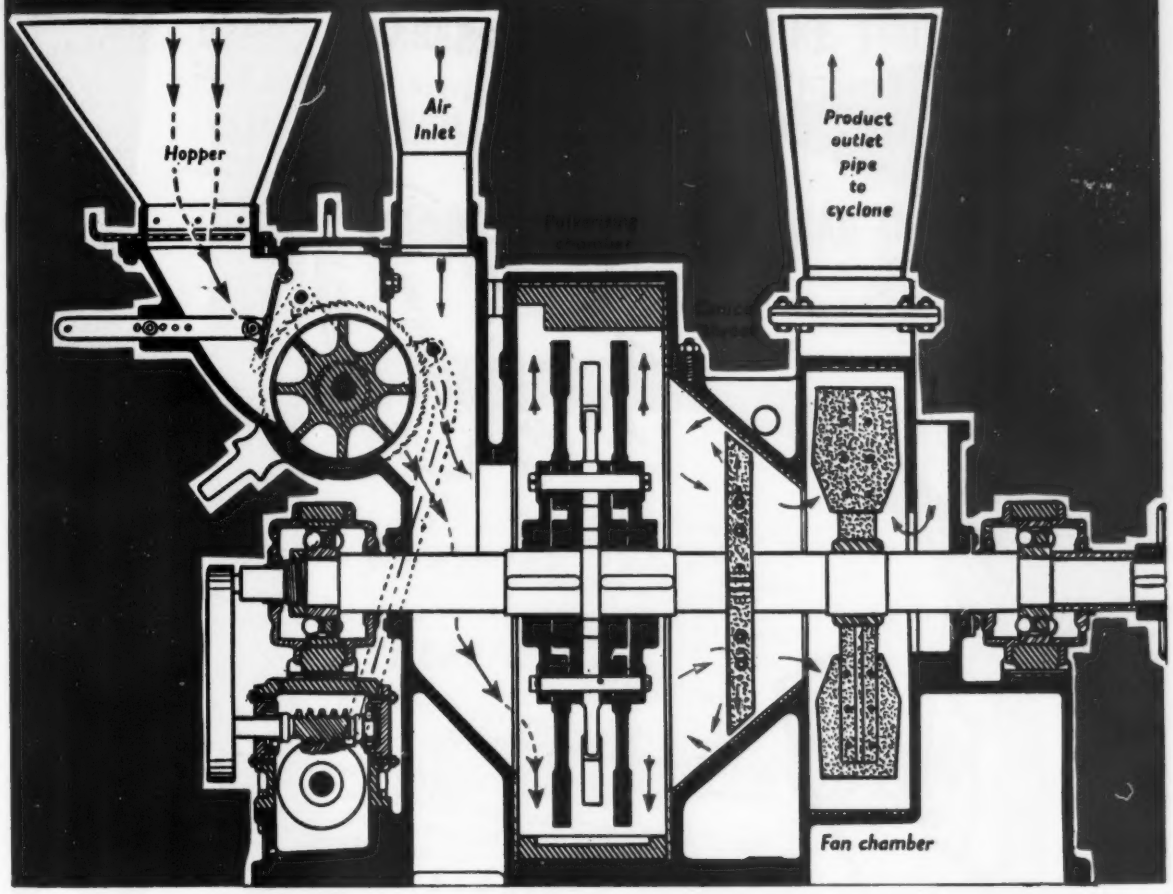
Divisional Offices:

LONDON	Norman House, 105-9, Strand, W.C.2. Tel: TEMple Bar 4455.
MANCHESTER	144-6, Deansgate. Tel: Deansgate 6451.
BIRMINGHAM	14-20, Corporation Street, 2. Tel: Midland 6954-8.
GLASGOW	124, St. Vincent Street, C.2. Tel: Central 9561.
BELFAST	35-37, Boyne Square. Tel: Belfast 26094.
DUBLIN	53, Middle Abbey Street. Tel: Dublin 45775.

"CARLONA" *is a Registered Trade Mark*

TH.1

Consistent grinding of non-abrasives



RAYMOND IMPAX PULVERISER

High-speed, swing-hammer pulveriser for coarse or medium grinding of non-abrasive materials • System under partial vacuum ensures dustless operation • Consistency of finished product guaranteed • Easily adjustable fineness control • Simple design, robust construction • Main shaft supported on ball bearings • Manganese steel hammers • All wearing parts easily accessible for renewal • *Please write for full details of the five available sizes.*

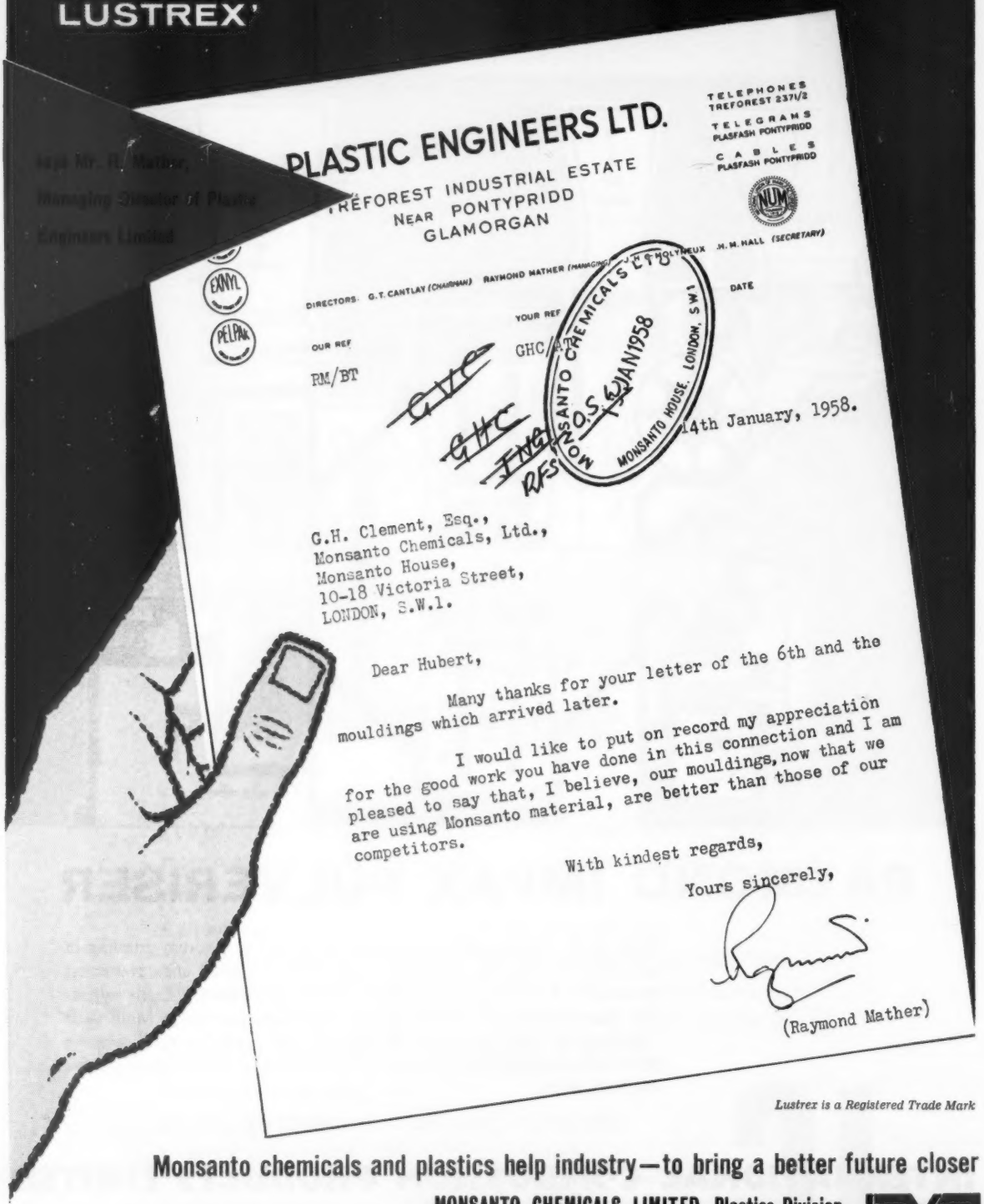
IC

INTERNATIONAL COMBUSTION PRODUCTS LIMITED

LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.I. TELEPHONE: TERMINUS 2833
WORKS: DERBY

TGA 8947

'OUR MOULDINGS ARE NOW BETTER THAN COMPETITORS'—THANKS TO LUSTREX'


PLASTIC ENGINEERS LTD.
TREFOREST INDUSTRIAL ESTATE
NEAR PONTYPRIDD
GLAMORGAN
TELEPHONES TREFOREST 2371/2
TELEGRAMS PLASFASH PONTYPRIDD
CABLES PLASFASH PONTYPRIDD
DIRECTORS: G.T. CANTLAY (CHAIRMAN) RAYMOND MATHER (MANAGING) H.M. HALL (SECRETARY)
OUR REF RM/BT
YOUR REF GHC/
DATE
MONSANTO CHEMICALS LTD. MONSANTO HOUSE, LONDON, S.W.1 RECEIVED 16 JAN 1958
14th January, 1958.
G.H. Clement, Esq.,
Monsanto Chemicals, Ltd.,
Monsanto House,
10-18 Victoria Street,
LONDON, S.W.1.
Dear Hubert,
Many thanks for your letter of the 6th and the mouldings which arrived later.
I would like to put on record my appreciation for the good work you have done in this connection and I am pleased to say that, I believe, our mouldings, now that we are using Monsanto material, are better than those of our competitors.
With kindest regards,
Yours sincerely,
(Raymond Mather)

Lustrex is a Registered Trade Mark

Monsanto chemicals and plastics help industry—to bring a better future closer

MONSANTO CHEMICALS LIMITED, Plastics Division,
503, Monsanto House, Victoria Street, London, S.W.1, and at Royal Exchange, Manchester, 2.

In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Ltd., Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Ltd., Bombay. Representatives in the world's principal cities.

Monsanto Regd.

AGRICULTURE

AUTOMOTIVE INDUSTRIES

EARTH MOVING · MACHINE TOOLS

MECHANICAL HANDLING

MARINE ENGINEERING · GAS INDUSTRY

WHATEVER THE JOB

THERE'S A

DUNLOP

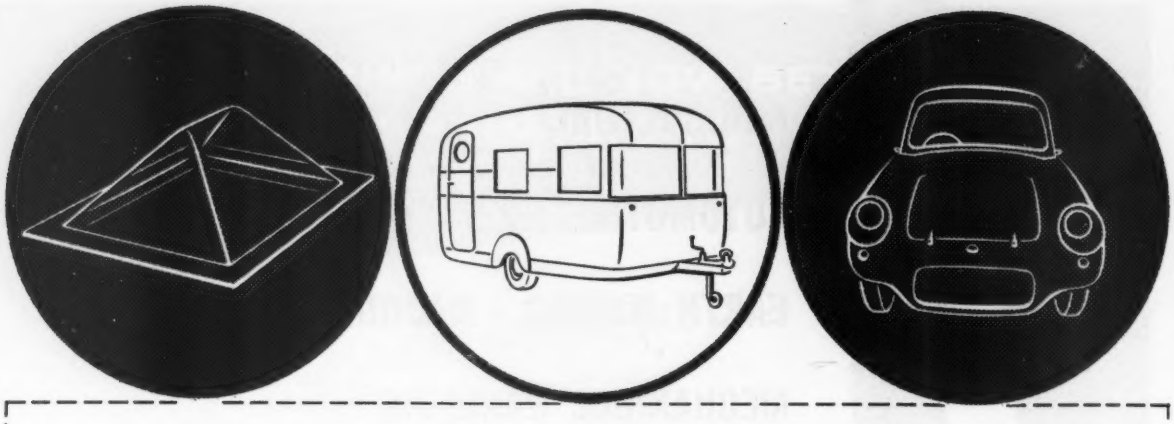
FLEXIBLE PIPE

TO CARRY IT THROUGH

Dunlop Technicians will always advise on any problems concerning installation of Flexible Pipes, write please to :—

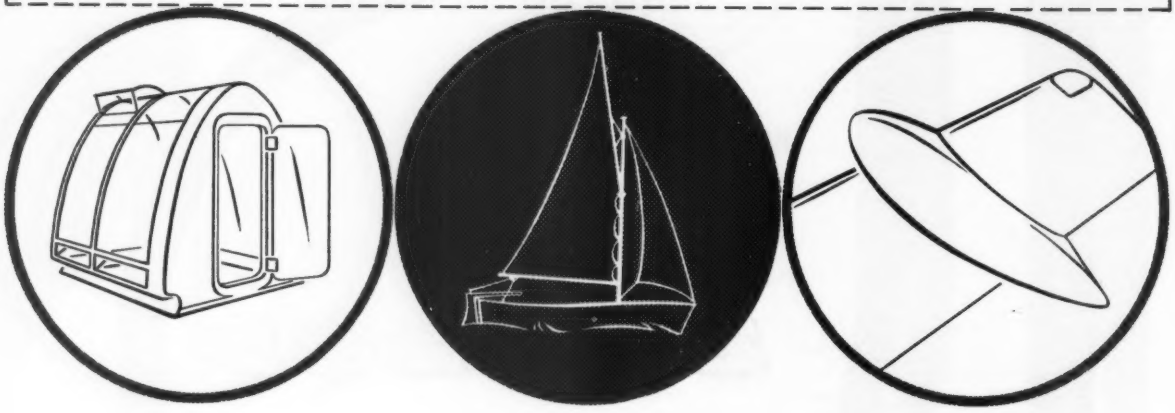
DUNLOP RUBBER COMPANY LIMITED · ST. GEORGE'S ROAD · COVENTRY · TELEPHONE: COVENTRY 64171

B



For the manufacture of

POLYESTER RESINS



PROPYLENE GLYCOL

and a wide range of other glycols

SHELL CHEMICAL COMPANY LIMITED

In association with Petrochemicals Limited and Styrene Products Limited

Divisional Offices:

LONDON: Norman House, 105-109 Strand, W.C.2. Tel: TEMple Bar 4455. MANCHESTER: 144-6 Deansgate. Tel: Deansgate 6451

BIRMINGHAM: 14-20 Corporation Street, 2. Tel: Midland 6954-8. GLASGOW: 124 St. Vincent Street, C.2. Tel: Glasgow Central 9561

BELFAST: 35-37 Boyne Square. Tel: Belfast 26094. DUBLIN: 53 Middle Abbey Street. Tel: Dublin 45775

SHELL

PGI/1

AVAILABLE FROM U.K. PRODUCTION

It takes more than one good catch to make a fisherman

. . . and it takes more than one success to make a business. While we won't go through a full list of our successes in the past (let's just say that several very well known concerns are our regular customers), if long experience in the highest quality precision moulding is what you're looking for, plus the capacity to turn out a job bang on time, contact:

Metropolitan Plastics Ltd

Specialists in thermo-setting plastics

Glenville Grove, Deptford, London SE8
Telephone: TIDeway 1172

The fourth man . . .

We start mould-making with our brains. We examine your product with you from every angle—design, material, machine quantity. And when we are agreed on the right way to do the job, then we start. We design, plan and make the mould that will produce the best job and the largest quantity for the lowest cost—for that, and only that, is the right mould for your job.

Centre above, is Douglas Bessant, Works Director, ex-apprentice toolmaker, thoroughly versed in mould-making techniques in Britain, U.S.A. and other countries. He is in charge of your mould. With him are B. Slater, planning engineer, and P. J. Perry, senior estimator, experts all.

The fourth man ?—well, he could be you.

UNIVERSAL TOOLS LTD.

Mouldmakers to the Plastics Industry

TRAMWAY PATH, MITCHAM, SURREY. Telephone: MITcham 6111

Mackintosh by Ghillie-Valspar.

Ask Berk for P.V.C. Stabilisers

FLOMAX 25 for clearer clears and brighter colours. FLOMAX 25 is a new liquid barium/cadmium organic outstanding for clarity, economy, easy use.

It gives extraordinary heat and light stability and contributes to high resistance to yellowing and plate-out. With plastisols it gives low initial paste viscosity and as it is free from soaps there is little viscosity build-up.

With **NALZIN,** an effective new zinc organic co-stabiliser, protection against sulphur staining is assured.

Also available are three other non-lead stabilisers—

CLARITE, PROVINITE, TEMEX

F. W. BERK & CO., LTD.

BERK HOUSE, PORTMAN SQUARE, LONDON, W.1

Telephone: HUNter 6688

REINFORCED GLASS FABRIC AND ASBESTOS LAMINATES

TP DUNSTABLE

INJECTION AND COMPRESSION MOULDINGS

PIONEERS AND PRODUCERS

For plastics in Industry, Thermo-Plastics are recognized as the pioneers in the development of new techniques. In numerous and ingenious ways, from the imaginative stage to the actual accomplishment, they render an unrivalled service to Industry. No matter how complex or complicated *your* plastic problem seems, the accumulated knowledge and experience of their qualified staff is at your disposal.
Your enquiries are cordially invited.

THERMO-PLASTICS LTD

Moulders & Fabricators of ALL Plastic Materials

Specialists in "Perspex", Cellulose-Acetate, Rigid P.V.C. Polyethylene fabrications; glass laminates and bonding of rubber to "Perspex" and metal; compression and injection mouldings in Phenol-Formaldehyde, Urea-Formaldehyde, Polyethylene, Polystyrene, Cellulose-Acetate, etc.

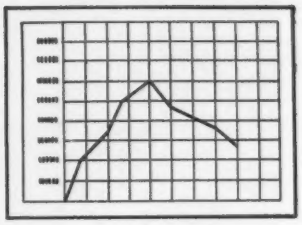
THERMO-PLASTICS LTD . DUNSTABLE . BEDS

A Member of the Tootal Group

Telephone: DUNSTABLE 1444 (6 lines)
Telegrams: THERMOPLASTICS DUNSTABLE

VACUUM FORMING

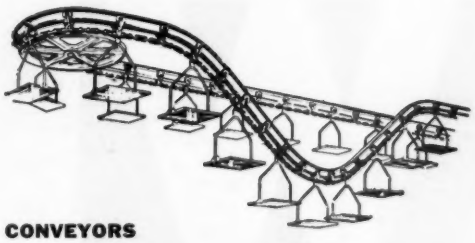
"PERSPEX" RIGID P.V.C. AND SHEET FABRICATIONS



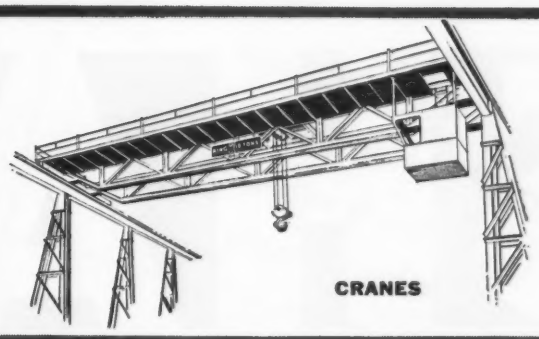
Have you a materials handling problem?

If you have — call us in. No matter what your problem, we will find a solution. *You have no obligation. And this service is free.*

KING conveyors, cranes, pulley blocks, etc., are cutting costs and increasing production all over the world.



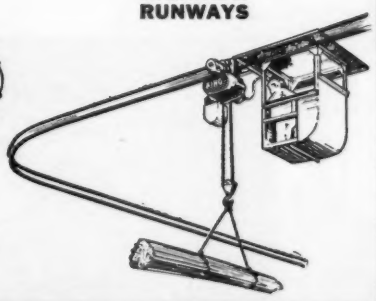
CONVEYORS



CRANES

ELECTRIC PULLEY BLOCKS

OVERHEAD RUNWAYS



DO THIS NOW—BEFORE YOU FORGET

Just tick those items on which you need information, add your name and address and send the advertisement to us.

CONVEYORS		CRANES	
ELECTRIC PULLEY BLOCKS		OVERHEAD RUNWAYS	
ADVISORY SERVICE			

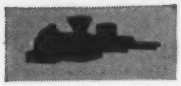
KING

REGISTERED TRADE MARK

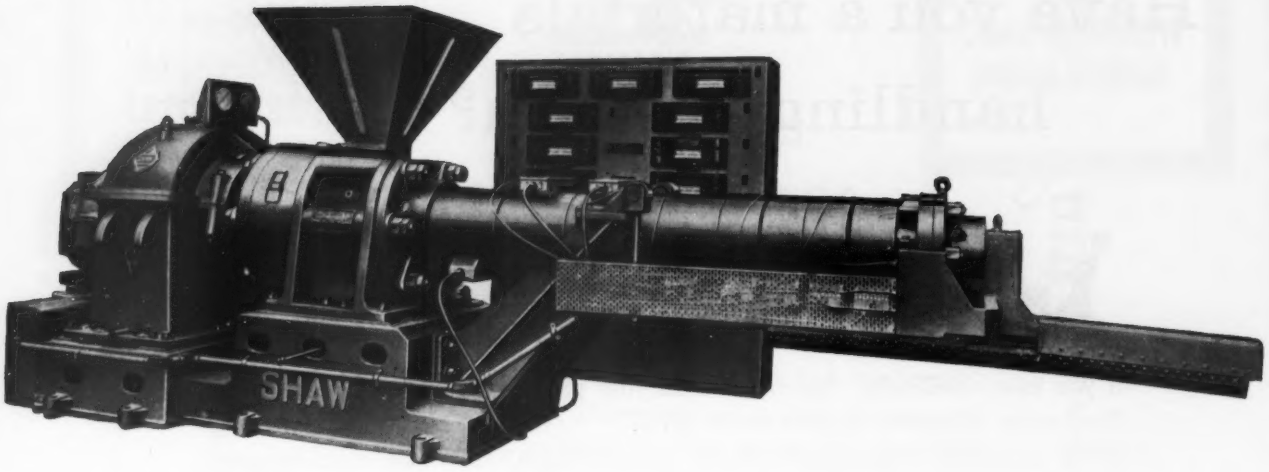
Leaders in MECHANICAL HANDLING for 40 years

Some famous firms who are using KING equipment DUNLOP, FRIGIDAIRE, I.C.I., AUSTIN MOTORS, VAUXHALL MOTORS, B.O.A.C., ROBBIALAC, BRISTOL AIRCRAFT COMPANY, NATIONAL CASH REGISTERS, ELECTROLUX

GEO. W. KING LTD., 31 ARGYLE WORKS, STEVENAGE, HERTS. TELEPHONE: STEVENAGE 440



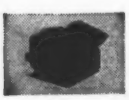
PLASTIC EXTRUDER. Fine temperature control is a vital feature of Francis Shaw extruders. All-electric heating in separate zones is provided, each zone being separately controlled by proportioning instruments. A wide range of screw and die designs is available for the production of piping, sheeting, sections and the sheathing and insulation of cables. Extruder sizes from 1″ to 12″.



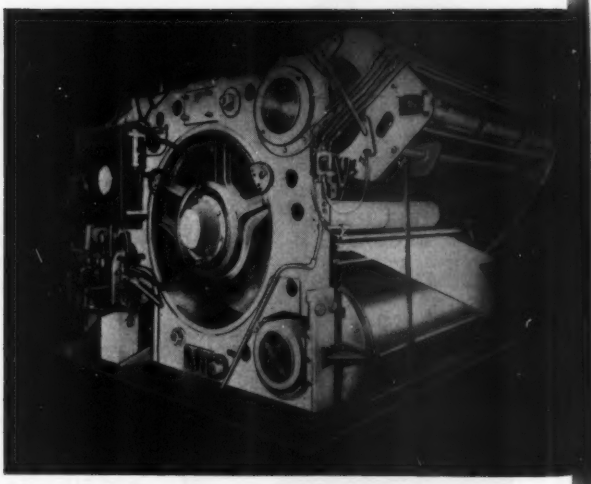
FRANCIS SHAW

quality engineering puts efficiency into Shaw machines

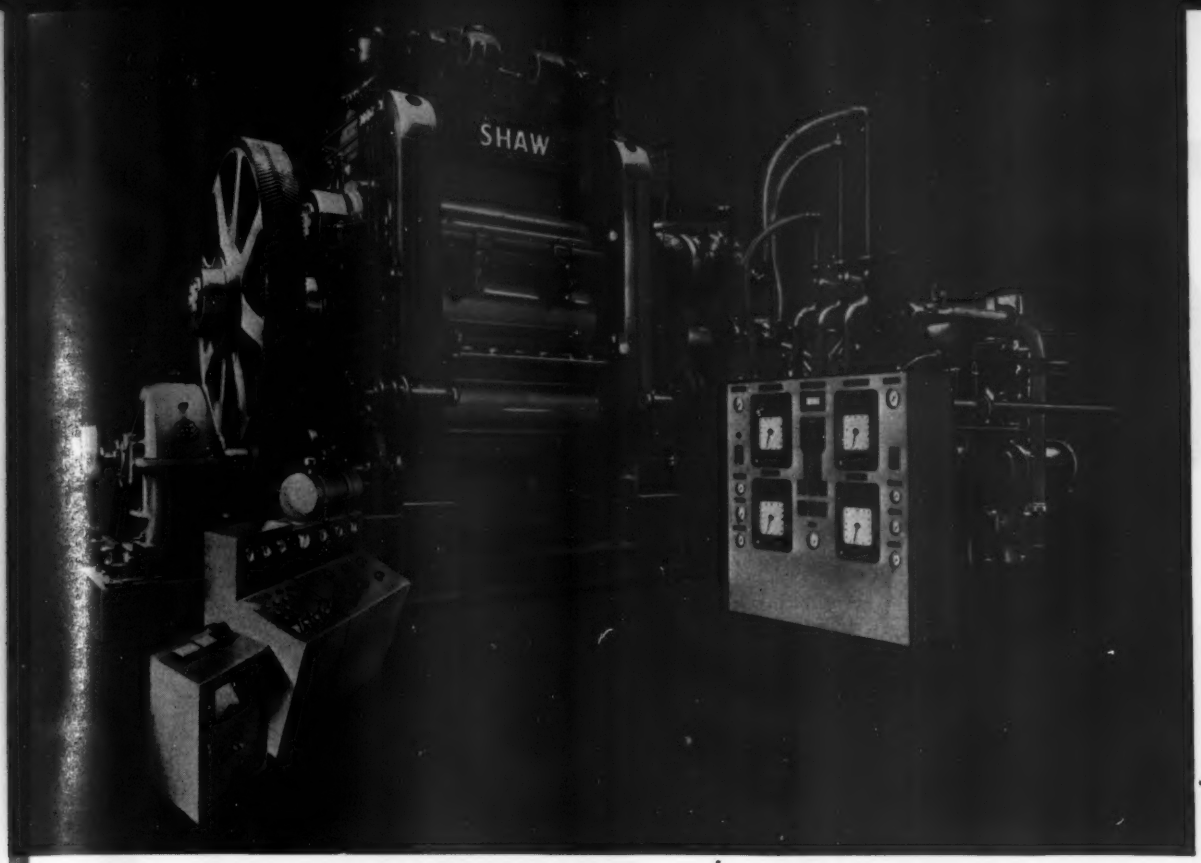
The cost-cutting performance of every Francis Shaw machine and its thorough dependability are the result of long experience and unvaryingly high standards of engineering in every detail of manufacture.
Close-limit accuracy and rigorous inspection during manufacture guarantee to the user a consistently high quality output from Francis Shaw equipment.



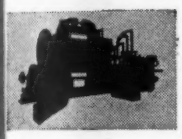
SHAW ROTOCURE. For perfect quality continuous curing of belting, matting, flooring and other flat products, eliminating the time-wasting operations of opening, cooling, re-heating and closing of hydraulic presses.



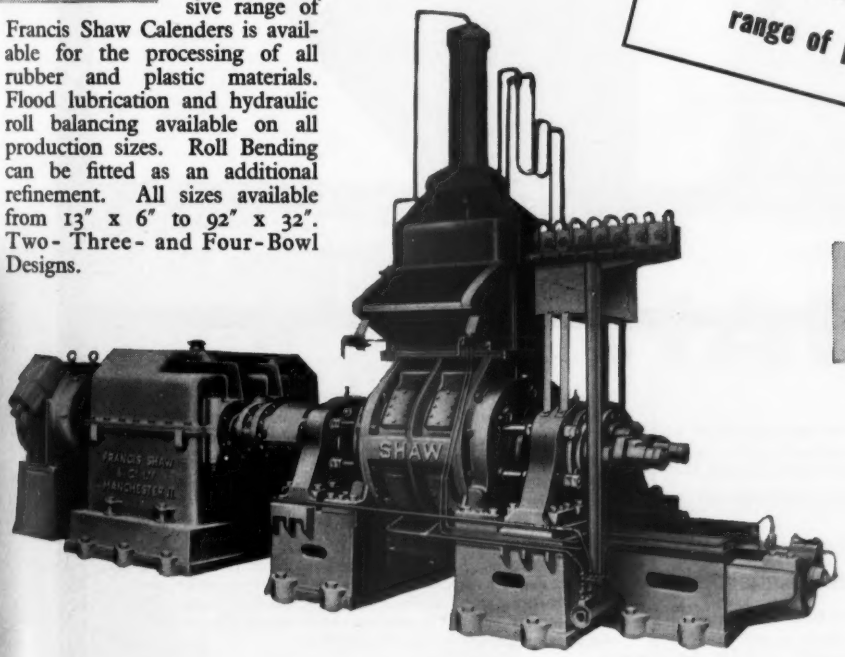
QUALITY ENGINEERING FOR QUANTITY PRODUCTION



Francis Shaw are available for the design, manufacture and installation of a wide range of processing equipment



CALENDER A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13″ x 6″ to 92″ x 32″. Two- Three- and Four-Bowl Designs.



INTERMIX. A robust high efficiency heavy duty internal mixer for mixing plastic compounds at lower-than-normal temperatures. It is supplied with steam heating for plastics and other materials, and the exclusive rotor design ensures consistent high quality mixing.

FRANCIS SHAW & COMPANY LIMITED MANCHESTER II ENGLAND

TELEPHONE EAST 1415-8 TELEGRAMS CALENDER MANCHESTER TELEX 66-357

LONDON OFFICE TERMINAL HOUSE GROSVENOR GARDENS SW1 TEL SLOANE 0675-6 GRAMS VIBRATE LONDON TELEX 2-2250

"Well, it certainly looks all right"

That's about as far as any intelligent engineer will go, the first time he's confronted with a new kind of temperature controller. Very sensible of him, too. For without firsthand evidence of its work on his projects, how can he judge its performance against all the others.

WE PROVE IT'S ALL RIGHT

West have every confidence in their instruments. But they recognise that it's necessary to pass that confidence on to you. We want you to be sure that West temperature control really is best for your specific moulders and extruders. And this is how we do it.

OUR SIXTY DAY SALES DEMONSTRATION

works like this:—First, we give you full facts about the instrument in the West range most likely to fit your needs. Then, we answer your technical queries. Finally, we install it, quite without charge or obligation, on one of your machines. We leave it installed and working for sixty days. Then we come back and talk to you again. Our technical service department will be most glad to help you.

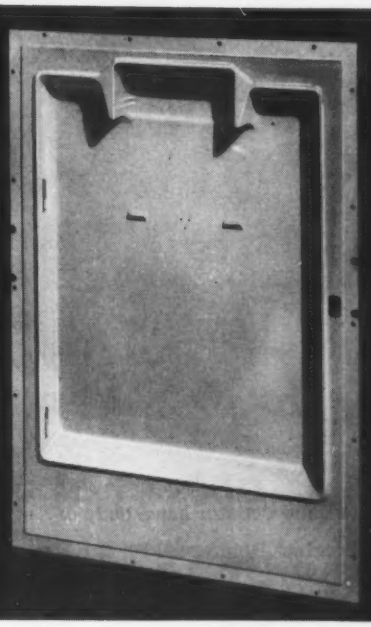
JP PROPORTIONING TYPE CONTROLLER, shown here, works within very fine tolerances, corrects for thermal inertia, does not overshoot control points. All components under-run for reliability. No thermionic valves; extremely robust. No transistors: unaffected by ambient temperatures. Control unit simply unplugs for service or replacement.

WEST *Instrument* **LIMITED**

52 Regent Street, Brighton, Sussex, England.

Phone: Brighton 28106

West Instrument Corporation, 4363 W. Montrose Ave., Chicago 41, Ill., U.S.A



HALEX

produce a full range of industrial mouldings and plastic fabrications to the high standards demanded by every kind of industry.

HIGHAMS PARK, LONDON, E.4.

Telephone: Larkswood 2345

SCOOTER with a moral

Body shell, weathershield and front and rear mudguards, side panels, head-lamp cowling, dash board, foot boards and petrol tank of the Bond Scooter are all in F.R.P. Manufacturers and moulders: Sharp's Commercial Ltd., Preston.

The Bond Scooter has a body of Fibreglass Reinforced Plastic because — and we quote — "it enables us to save 40 lb. in weight and this gives a consequent increase in performance". To this we would add that bodies in F.R.P. are easily moulded into complex shapes without expensive equipment; that they will not dent, drum or corrode. The moral here is that what applies to scooters applies just as forcibly to cars and vans, trucks and pantechnicons. All can benefit from the lightness, toughness and malleability of F.R.P. Why, then, aren't more vehicle manufacturers using it? The short answer is that they are!

FIBREGLASS
TRADE MARK

the backbone of reinforced plastics

Our F.R.P. advisory service is expert, confidential and free.

NETTLEFOLDS-PARKER-KALON
HEXAGON SOCKET CAP
AND SET SCREWS

If it's a matter of
how to fasten
one thing to another,
get in touch with

GKN

GUEST KEEN & NETTLEFOLDS (MIDLANDS) LIMITED.
SCREW DIVISION: BOX 24, HEATH STREET, BIRMINGHAM 18

2/5/2306

EACH **NB & C.** INJECTION PRESS
ENJOYS **TWO YEARS** GUARANTEE

The new

NB 30 *RECORD*

the machine for small and large concerns

INJECTION CAPACITY MODEL	oz.
semi-automatic	
NB 28	1
NB 30 RECORD	1
NB 40	1.4
automatic	
NB 60 E	2.1
NB 100	3.5
NB 160	5.4
NB 360/520	19
fully automatic	
RAPID 01/02	0.53 - 0.85
RAPID R 6 FA	3
RAPID R 12 FA	6
RAPID R 20 FA	12

NEGRI BOSSI & C.

MILANO/ITALY - VIA BAZZINI 24
TELEFONI 230.512 - 235.555 - 235.884

Our NB 28, NB 40 and now the new NB 30 RECORD can indeed be regarded as the ideal production equipment not only by small or medium-sized concerns, but also by the large plant where a great variety of small mouldings are manufactured. These machines are rugged enough to work round the clock, requiring practically no maintenance.

NB&C

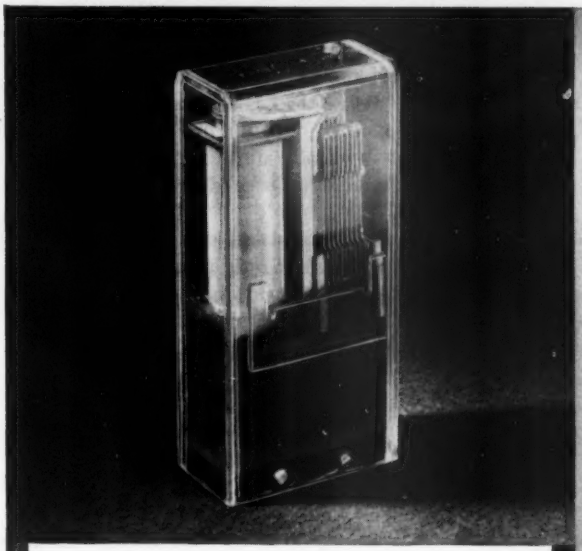
CABLES
Negribos Milano

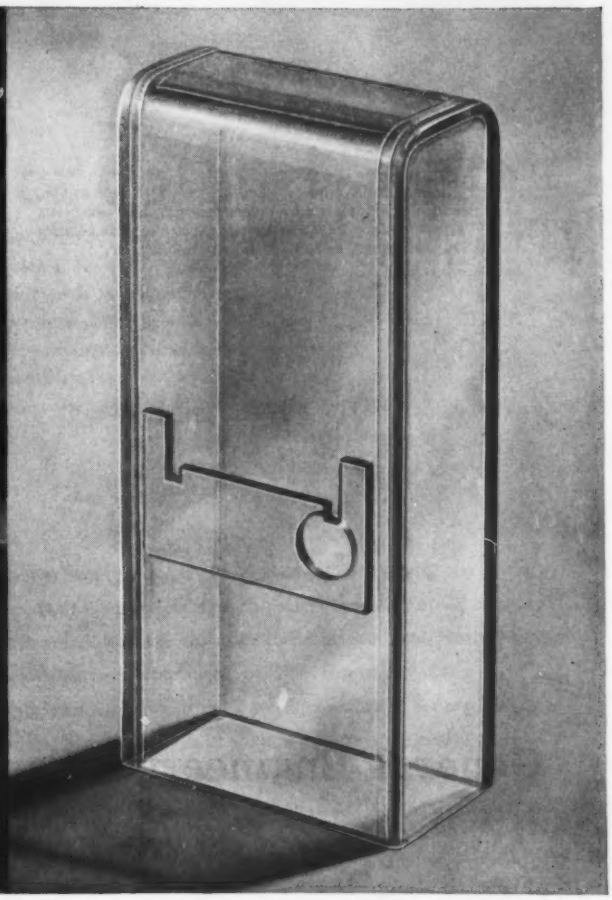
LONDON TRANSPORT CHOOSES

non-inflammable COBEX

for sealed relays used with signalling

Because it is non-inflammable, as well as being transparent and a good electrical insulator, Cobex was chosen for a range of signal relays cases for London Transport. Safety and efficiency formed the basis for its selection, and the use of Cobex for these important components underlines why it is being specified in many industries where its unique combination of properties can result in safer and more dependable installations. Ask for publication No. 565 and technical Data Sheets.





Cobex

RIGID VINYL SHEET

a product of

BX PLASTICS LTD HIGHAM STATION AVENUE · LONDON E4

Subsidiary of The British Xylonite Co Ltd Telephone: Larkswood 5511

The machine illustrated is a horizontal belt-type capstan unit, used in the electric cable industry. Such units can be used, along with extruder drive, to give linked tension control on complete plastic sheathing line.

. . . Generally speaking

If you can call engineering techniques involving high vacuum, hydraulics, pneumatics, electronics, physics, and all the rest, " general " engineering, then that is what we are called ! But generally we are regarded as very specialized engineers.

One field of activity where specialization is particularly required is equipment for the impregnation of paper-insulated cables, turbo-generator windings, etc., but another field in which we specialize, with almost universal application, is high vacuum pumps and equipment.

Yet another departure, but one again requiring a high degree of technical knowledge, is the manufacture of the huge " DANO " refuse disposal and composting plant. A revolutionary method of combining both sewage and refuse disposal economically and hygienically, supplying at the same time a marketable product, a highly organic compost.

Returning to the electrical industry we have recently designed and produced some outstanding equipment for the manufacture of domestic and telephone cable, including pay-off, extrusion, water troughing, measuring, capstan, and take-up equipment. And when we say outstanding we really mean in operational range and performance.

Of course, our enthusiasm in engineering developments has not been disregarded. The evidence of our success can be measured by our continued expansion.

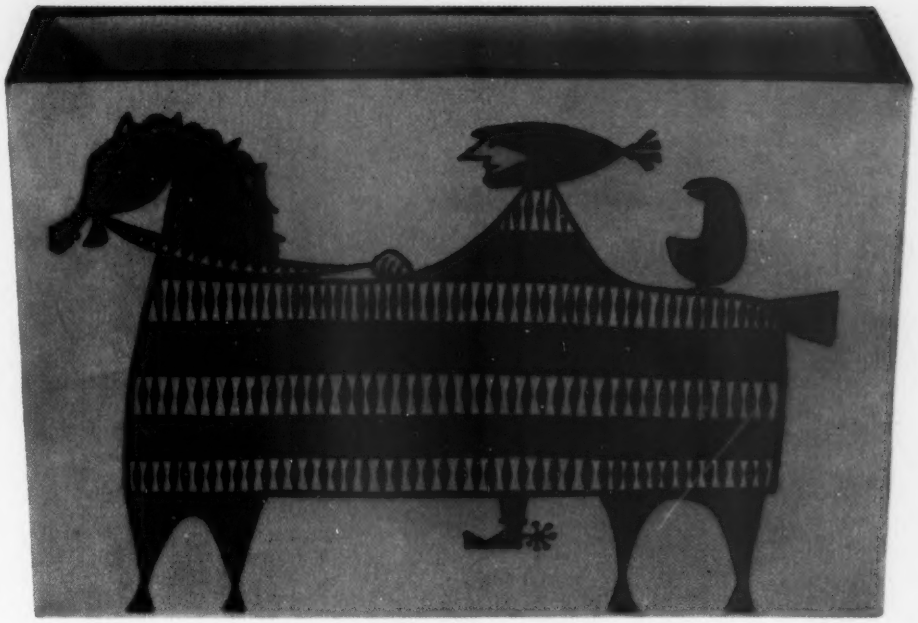
Why not write us for a copy of our " Summary of Products ? " You may find that an inquiry is well worthwhile, and if warranted we should be glad to discuss your matter personally. Do not hesitate to write or phone the Works or any of our district offices or agents.

General Engineering Company (Radcliffe) Limited

Bury Road · Radcliffe · Manchester · Lancashire
Telephone: Radcliffe 2291–4. *Telegrams: "General," Radcliffe Lancs.*
London: 6 Lambeth Road, S.E.1. *Telephone: Waterloo* 2248
Midlands: 283 Stratford Road, Shirley, Solihull, Warwickshire
Telephone: Shirley 4508
Scotland: 15 Moray Place, Edinburgh, 3. *Telephone: Caledonian* 5597

Represented in nearly every country in the world

SWEDEN



Stig Lindberg, of A. B. Gustavsbergs Fabriker, is one of Sweden's foremost ceramics designer/craftsmen. His countrymen's lively colour sense and lack of colour prejudice is the theme of his message and is exemplified in the charming example of his work shown alongside.

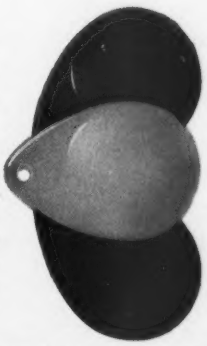
the language of colour

"As a country, Sweden is extensive. So is its range of colours—from the strong, primitive colour-brilliance of the Lapps with burning red and yellow against black, right down to the dull colour-scale of the Scanians, dominated by earth-colours. There is no definite national preference for any individual colour. Besides, an isolated colour is like the sound of a single note, aesthetically unimportant. It affects us as an experience of art only when it becomes part of a three-dimensional form. When we are aiming at simple, clear forms, the colour becomes more important and serves as a counter-balance to extreme purism."

Stig Lindberg

colour matching

If a match is not available from the existing colour range, B.I.P. Chemicals Ltd. will produce a special and exact match of customers' colours, without extra charge, and subject only to reasonable minimum limits on quantity



The accent to-day, not only in Sweden but throughout the world, is on colour—the language of vision, the oldest language of all, yet only now in course of rediscovery. This tremendously vital trend imposes special responsibilities on materials manufacturers, but it is a responsibility by no means new to B.I.P. Chemicals Ltd. We are always able to offer the widest selection of colours—many hundreds of them—in the Beetle, Scarab and Melmex grades of Urea and Melamine moulding powders, whilst our Colour Matching sets the seal on this increasingly important aspect of service.

B.I.P. CHEMICALS LIMITED Oldbury, Birmingham. Telephone: Broadwell 2061

B·I·P

LONDON OFFICE: 1 Argyll Street, W.1. Telephone: Gerrard 7971

C

Essential Supply

How welcome is the sight of that light and lissom bronzed goddess as she trips lightly over the coral sands, bearing ' deluscious ' hands of ripe bananas to soothe the avaricious palates of fruit-hungry humanity.

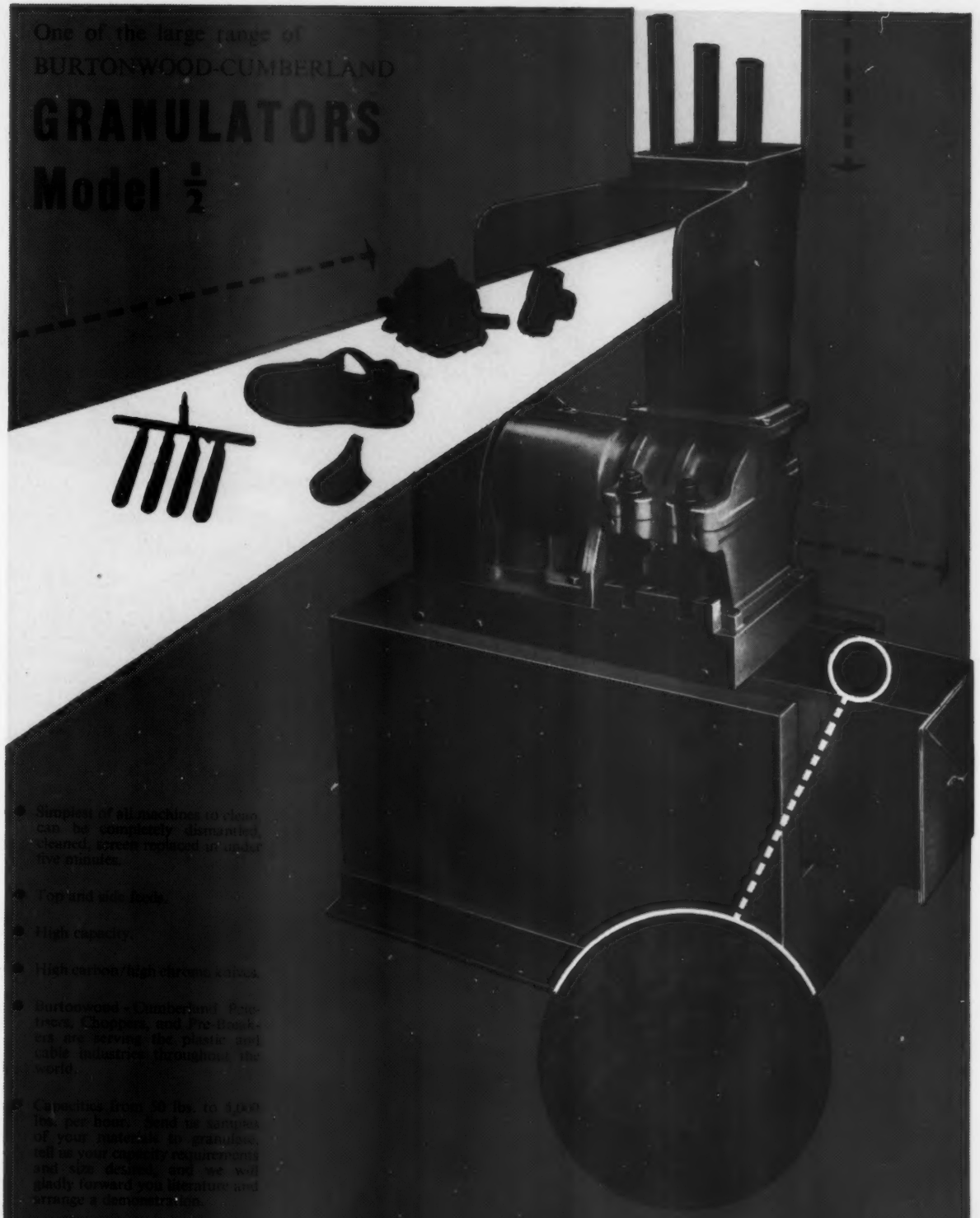
Her load is as welcome as a conspicuously painted drum of Ferguson's ' **NESTORITE** ' which is received by all discerning Plastic Moulders with satisfaction—because they know ***they're always right with ' Nestorite.'***

YOU'RE RIGHT WITH 'NESTORITE'

JAMES FERGUSON & SONS LTD.,
PRINCE GEORGE'S RD., MERTON ABBEY, LONDON, S.W. 19.
Tel: MITCHAM 2283 (5 lines) · Grams: NESTORIUS, SOUPHONE, LONDON

A. S. HARRISON & CO. (PTY) LTD.	85 Clarence St., Sydney, Australia. 120 Wakefield St., Wellington, New Zealand.
ANDRE BERJONNEAU	134 Avenue de Villiers, Paris 17, France.
JOSE DELCLOS MOLLERA	Angel Baixeras 39, Barcelona (2), Spain.
EINAR HOLMARK	19 Gl. Kongevej, Copenhagen V, Denmark.
ALLMANNA HANDELSAKTIEBOLAGET	Stockholm, Sweden.

One of the large range of
BURTONWOOD-CUMBERLAND
GRANULATORS
Model ½

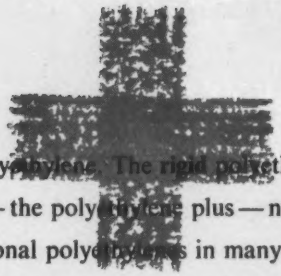


- Simplest of all machines to clean can be completely dismantled, cleaned, screen replaced in under five minutes.
- Top and side feeds.
- High capacity.
- High carbon/high chrome cutters.
- Burtonwood-Cumberland Pelletisers, Choppers, and Pre-Breakers are serving the plastic and cable industries throughout the world.
- Capacities from 20 lbs. to 4,000 lbs. per hour. Send us samples of your materials to granulate, tell us your capacity requirements and size desired, and we will gladly forward you literature and arrange a demonstration.

BURTONWOOD ENGINEERING COMPANY LIMITED

Head Office & Works: BURTONWOOD, WARRINGTON, LANCASHIRE. Telephone: Newton-le-Willows 2311 (10 lines)
London Office & Works: EDGWARE ROAD, THE HYDE, LONDON, N.W.9. Telephone: Colindale 4661 (7 lines)

RIGI



The new polyethylene. The rigid polyethylene.

RIGIDEX — the polyethylene plus — now introduced by BRP, surpasses all conventional polyethylenes in many essential properties and range of uses.

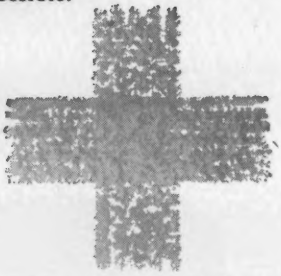
RIGIDEX is stronger, tougher, more rigid Makes thinner sections possible. Offers maximum economy in use and high impact resistance.

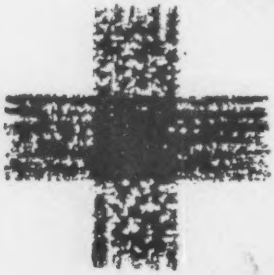
RIGIDEX has higher softening temperature Resists boiling water. Can be sterilised by autoclaving.

RIGIDEX is less permeable to liquids and vapours Gives maximum protection to food and drugs. Resists oils and corrosive chemicals.

RIGIDEX looks cleaner, feels fresher Mouldings possess exceptional surface finish. Pleasant to the touch.

PLUS ease of processing by all the usual methods.

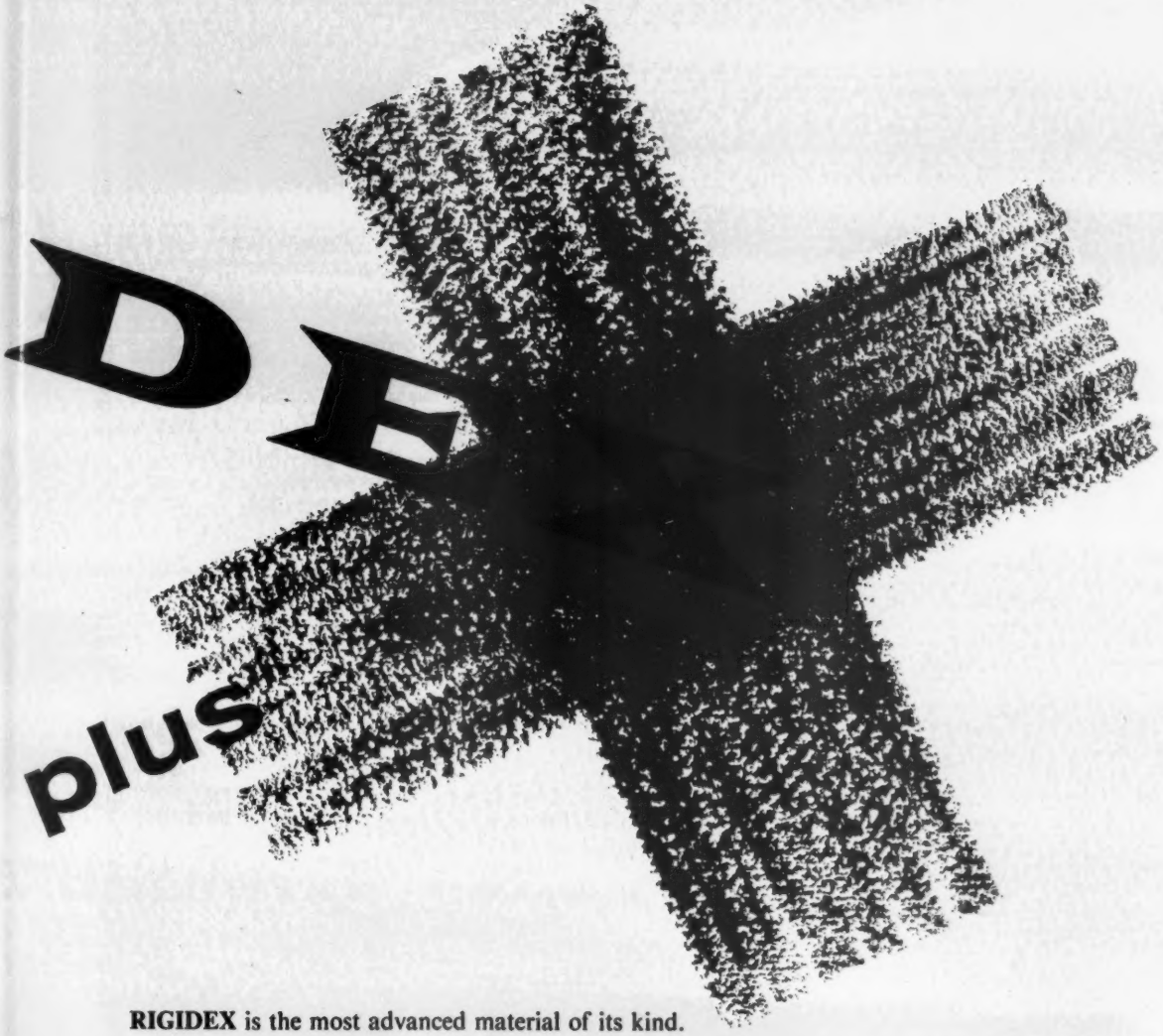




the polyethylene

Rigidex is made by a process developed by the Phillips Petroleum Company who have licensed the manufacturing rights to British Hydrocarbon Chemicals Ltd.

RIGIDEX



RIGIDEX is the most advanced material of its kind.
Investigate its advantages. Put it to profitable use now.
Don't delay! Write for Booklet No. 312.
giving further information.

BRP Sole Selling Agents

BRITISH RESIN PRODUCTS LIMITED

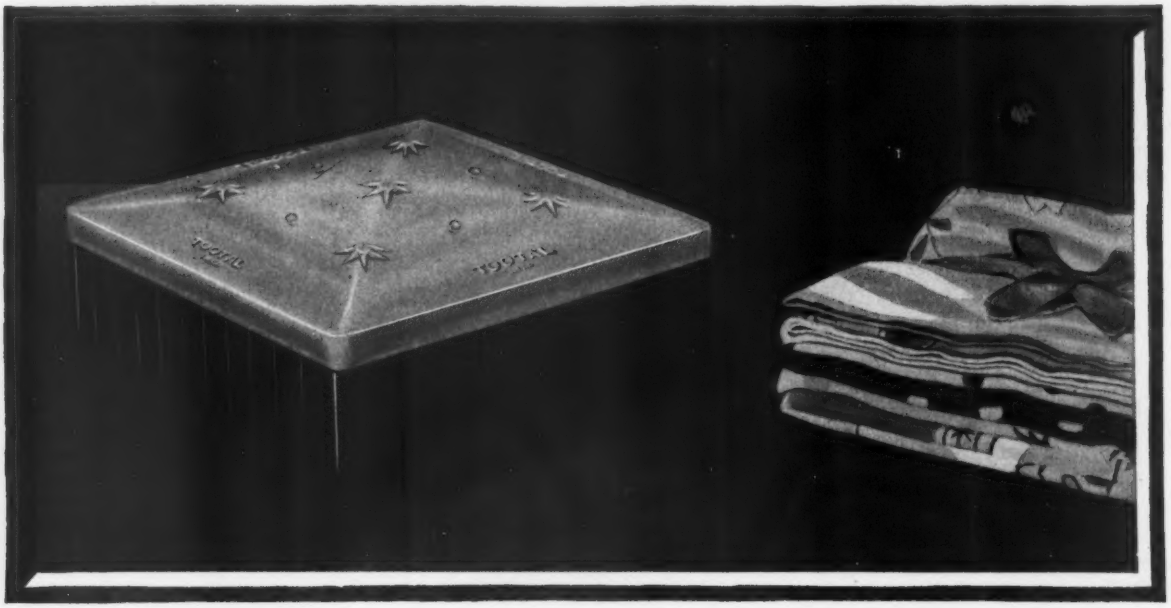
A member of the Distillers Plastics Group

SALES AND TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDe Park 0151

Two perfect cases for plastics

From handy tools to Tootal hankies—it's all the same to plastics. In each case Insulators provided the perfect answer with a beautifully fashioned yet functional container—completely in character with the product. Injection-moulded thermo-plastics are extremely versatile. In shots ranging from 1-oz. to 32-ozs., Insulators can shape them to meet every need. A first-class design department and 30 years experience are at your disposal with every enquiry

* *The two containers are shown by courtesy of the British Tap and Die Co., Ltd. and Messrs. Tootal, Broadhurst, Lee & Co., Ltd., respectively.*



Insulators Ltd

MOULDINGS OF MERIT

LEOPOLD RD., ANGEL RD., EDMONTON, LONDON, N.18.
'Phone: EDMonton 1491. 'Grams: Mermould, Southtot, London.
BRANCH FACTORIES: JARROW, Durham & PADDOCK WOOD, Kent.

100 times round the world— every year

To deliver all the Synthite Formaldehyde ordered by the Plastics Industry of Great Britain, our fleet of tankers has to travel the equivalent of 2,200,000 miles a year. More than 100 times round the world !

Synthite Ltd. are the country's largest suppliers of formaldehyde because Synthite Formaldehyde is trusted. It is tested, uniform. And it is delivered *where* it is wanted, *when* it is wanted.

SYNTHITE FORMALDEHYDE

DELIVERED BY QUICK TANKER SERVICE

Manufactured by

SYNTHITE LTD., WEST BROMWICH, STAFFS.

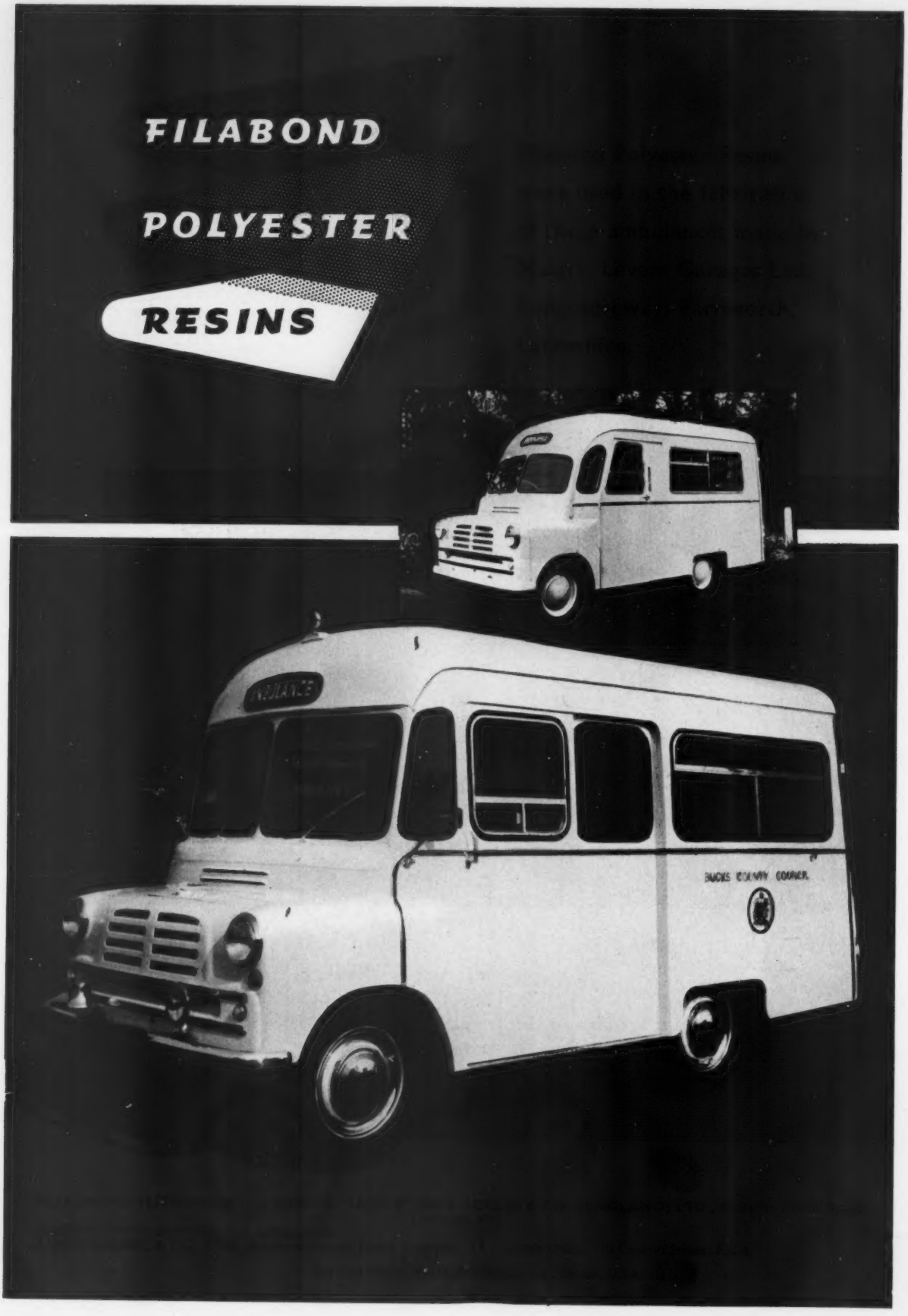
BRITAIN'S LARGEST SOURCE OF FORMALDEHYDE

Manufacturers of:

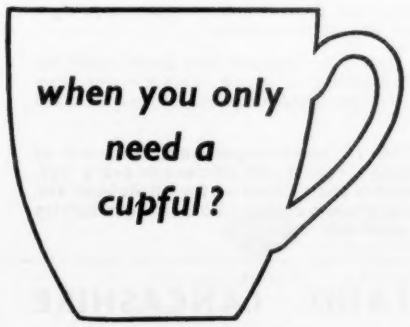
Formaldehyde 40% by volume and other qualities; Paraformaldehyde; Methylal; Paint Strippers; Special Solvents and Trioxane

Selling Agents:

BARTER TRADING CORPORATION LTD. 14 Waterloo Pl., London, S.W.1. *WHitehall* 3931


FILABOND
POLYESTER
RESINS
AMBULANCE
BUCKS COUNTY COUNCIL

why boil a kettle . . .

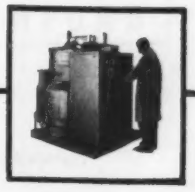


In terms of steam-raising, many establishments are doing just this. Others employ a Stone-Vapor steam generator, which uses fuel oil only in strict relation to the steam demand—minute by minute, automatically and without supervision. There are now in service multiple installations with outputs of 35,000 lb. steam per hour, modulating down to as low as 1,300 lb. per hour at constant full-load efficiency. Similarly, single unit installations modulating down to as low as 250 lb. per hour.

Consider the Stone-Vapor advantages: proved and tested in over 10,000 installations; steam raised in two minutes from cold; easy and inexpensive installation virtually anywhere due to small size and weight; smoke-free combustion; operation and maintenance the essence of simplicity; conforms to the strictest insurance requirements with unsurpassed safety. Quick delivery.

No investigation of modern steam-raising plant can be complete until you have full details and have witnessed the performance of Stone-Vapor steam generators.

J. STONE & CO. (DEPTFORD) LTD. LONDON S.E. 14 (TID 1202)

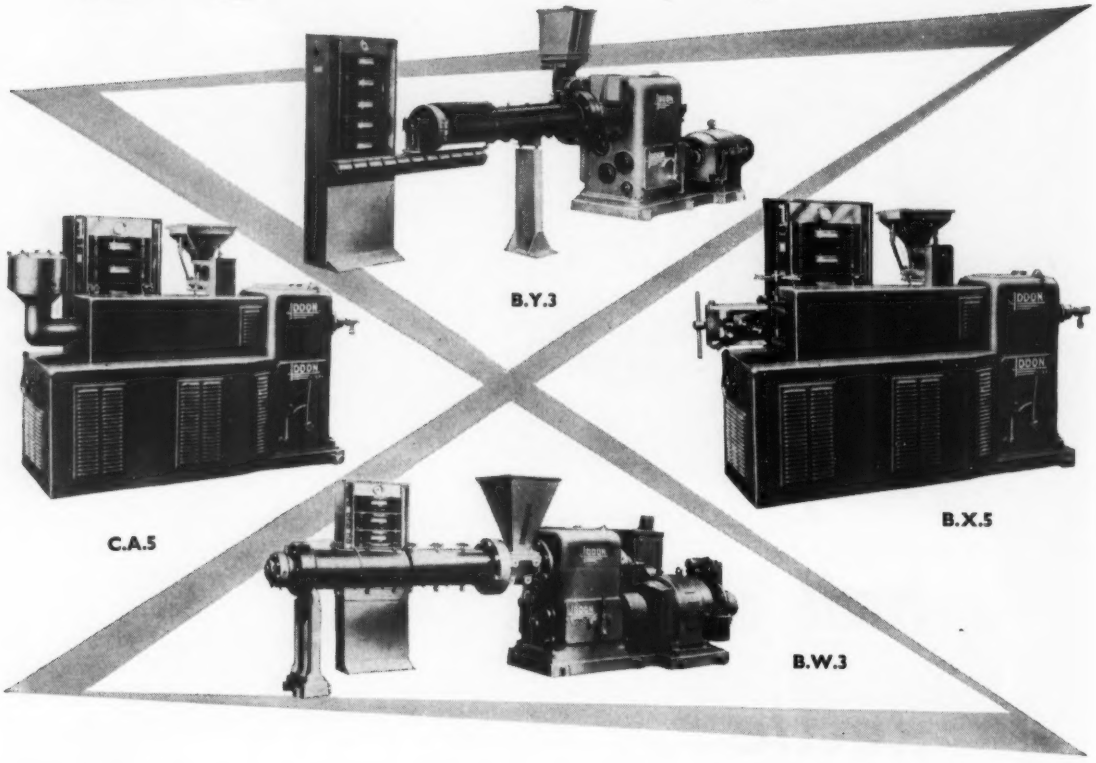


—manufacturing under licence of Vapor International Corporation Ltd., Chicago, U.S.A.

D

40 MACHINES

IN ONE FACTORY SPEAKS FOR ITSELF



C.A.5. Type X.L. Extruder driven by variable speed motor through 3-speed gearbox machinery, fitted with special lay-flat tubing die head.

B.Y.3. Type X.L. Extruder, motor driven through 3-speed gearbox. Electrically heated/water cooled extension with special die head for sheet extrusion.

To quote a Customer:—
"IDDON'S EXTRUDERS ARE REALLY GOOD"

B.X.5. Enclosed type X.L. Extruder with variable speed motor and 3-speed gearbox, swing type right angle head and vibratory feeder.

B.W.3. Type X.L. Extruder with barrel zoned for heating and cooling to ensure accurate temperature control. Variable speed motor drive through 3-speed gearbox.

Backed by 75 years' experience, they are of sound design, robust and efficient in every way. We welcome your enquiries for all Rubber and Plastics Extruders and our Consultation Service is fully available.

IDDON
BROTHERS LIMITED

LEYLAND · LANCASHIRE
Tel. **Leyland 81258-9** *Grams.* **Iddon, Leyland**

U.S. & Canadian Technical Sales and Service: Wilmod Company (Rubber Division), 2488 Dufferin Street, Toronto 10, Canada.
Tel.: Toronto Russell 1-5647.
Cables: Wilmo, Can. Toronto.

Manufacturers of Mixing Mills, Presses, Calenders and Extruding Machines for Rubber and Plastics Industries.

approved by the R.N.L.I.

oilskins made with Geon PVC

Vinco oilskins by M. Barr & Co Ltd.
Photograph by courtesy of the
Royal National Lifeboat Institution.

. . . another example of the high commendation
Geon is winning on land and at sea.
Protective clothing made with this most hard-wearing of plastics:

* has greater durability than traditional oilskins
* is unharmed by sea water
* stows wet without cracking or rotting
* is pliable, light and allows free movement

Geon PVC materials are polyvinyl chloride plastics, also used at sea in fishing floats, lifebelts and rafts.
For further information about Geon PVC please write for Booklet No. 51 free on request.

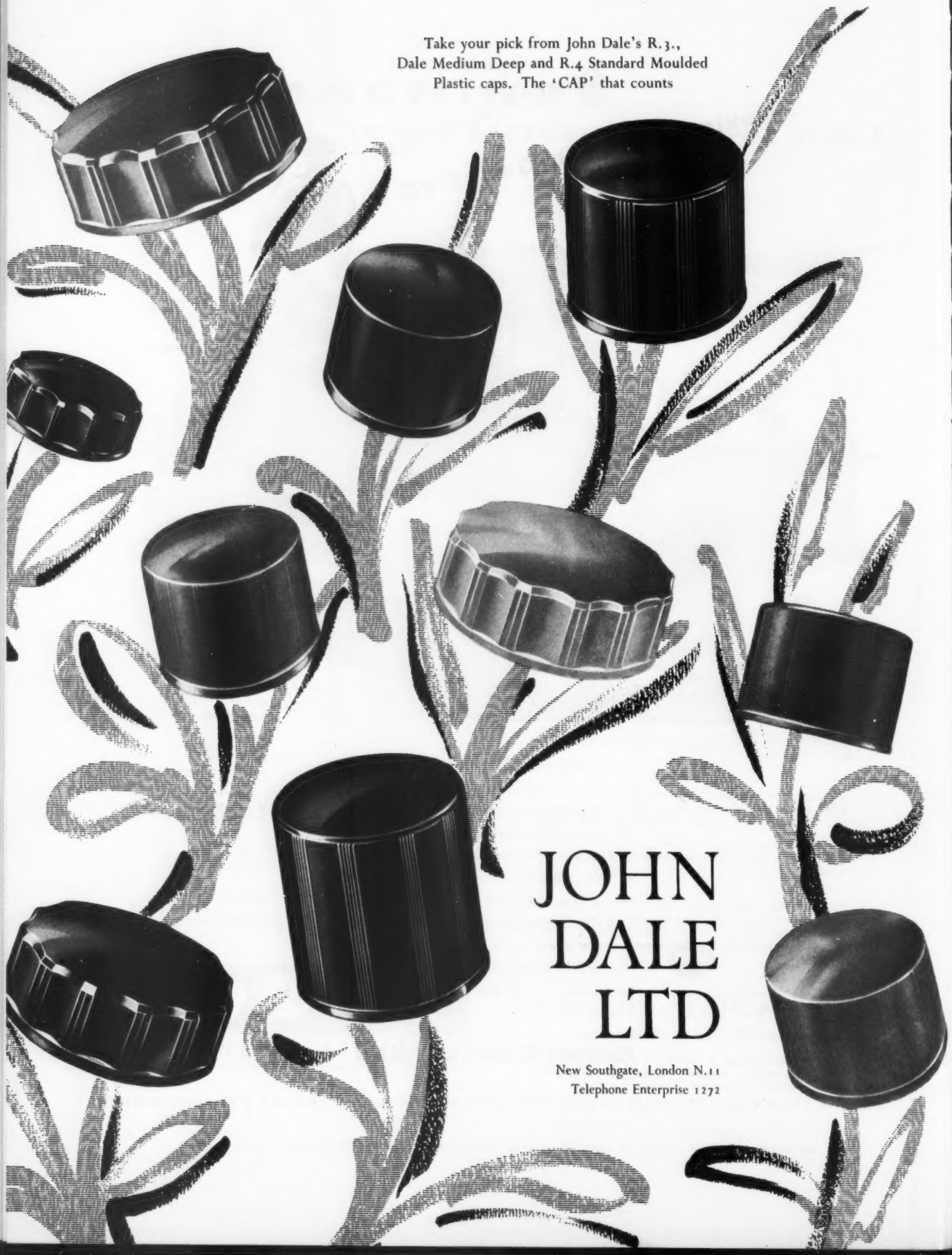
Geon

Geon is a reg'd trade mark

British Geon Limited

SALES & TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 7321

Take your pick from John Dale's R.3.,
Dale Medium Deep and R.4 Standard Moulded
Plastic caps. The 'CAP' that counts



JOHN
DALE
LTD

New Southgate, London N.11
Telephone Enterprise 1272

YOU CAN DEPEND ON W.E.I. DUAL WORM DESIGN

FOR THAT IMPORTANT BETTER QUALITY WITH YOUR

NEW PROCESSES AND NEW MATERIALS

IT DOESN'T PAY to be "near-sighted" in the highly competitive plastics manufacturing business . . . especially when your success depends on the profitable, trouble-free production of the wide range of newer materials such as low pressure polyethylene and other polyolefins, styrene copolymers, impact styrene and many others including synthetic rubber. There is no doubt that the unique W.E.I. Dual Worm design makes the BIG difference. Flight characteristics are custom-engineered from hundreds of proven combinations. And . . . there are limitless new combinations possible regardless of the *flexibility* required by your new higher quality standards and your sequence of compounding-extracting-extruding treatment.

W.E.I. COMPOUNDER-EXTRACTOR-EXTRUDERS ARE SERVING THE WORLD'S LEADERS IN THE PLASTICS, RUBBER AND CHEMICAL INDUSTRIES.

FROM feather-gentle action to severest pressures, from the most sensitive zonal heat control along the barrel to devolatilization of 50% solvents, or more, from plastics solutions — W.E.I. all-in-one-operation equipment is proving itself the best buy . . . the safest and most dependable investment.

• **ADDRESS:** *1-3 Chantepoulet Geneva, Switzerland*

• **CABLE ADDRESS:** *Weldingen Geneva, Switzerland*

WELDING ENGINEERS LTD. GENEVA

SERVING CONTINENTAL EUROPE AND THE BRITISH ISLES AS EXCLUSIVE SALES REPRESENTATIVES OF WELDING ENGINEERS, INC., NORRISTOWN, PENNA.

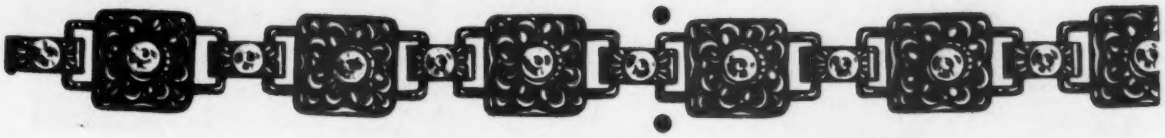
E

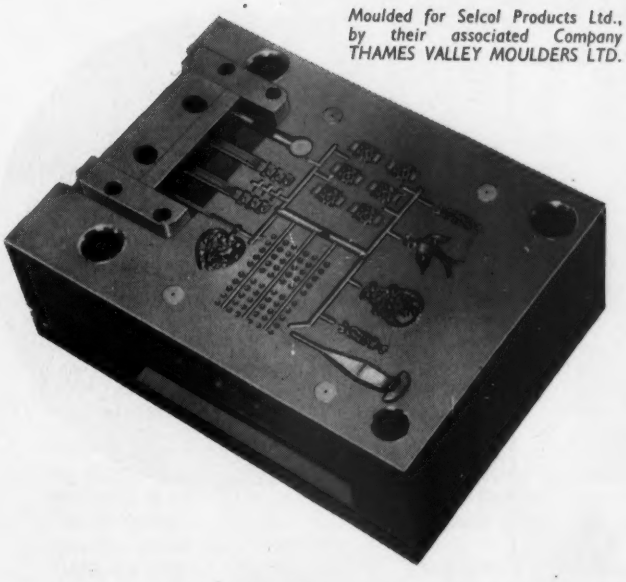
PLASTICS
ELO
PRODUCTS
BIRKBYS LTD. LIVERSEDGE, YORKSHIRE
London Office :- 79 Baker Street W.1.

Intricate Detail and Perfect Finish . . .

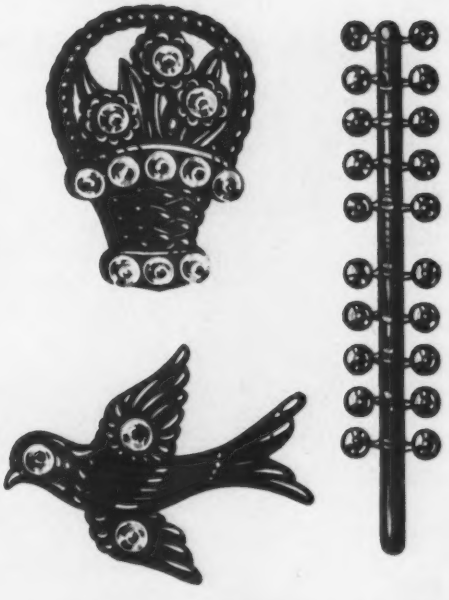
" The special features of this job are perfect finish and reproduction of detail." So wrote our customer, and in designing and making the complete tool LOSCA electro-formed cavities were included to achieve this. We could expound on other features, such as the ease of production and the saving in die costs—but why labour the point! If you are interested in injection moulding, slush casting of P.V.C. or blow moulding then you ought to know more about LOSCA moulds. The following leaflets are available if you just write in:

LOSCA Hard Nickel Electroformed Dies
Electroformed Dies for 3-Dimensional Mouldings
Electroformed Dies for Nylon Gears
LOSCA Prototype Die Service
LOSCA Repair Service (for steel dies)
Electroformed Moulds for Acrylic Teeth
Electroformed Shells for Slush Moulding P.V.C. Dolls and Toys





Moulded for Selcol Products Ltd., by their associated Company THAMES VALLEY MOULDERS LTD.

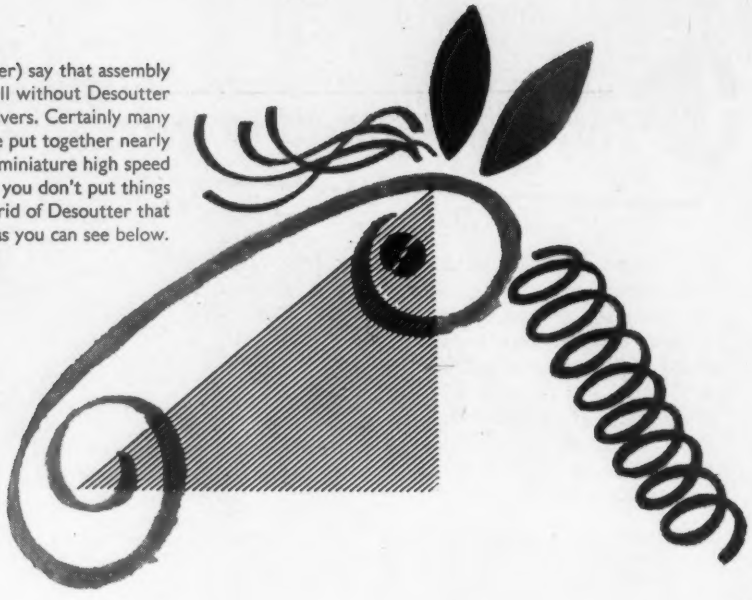


FROM LOSCA HARD NICKEL ELECTROFORMED DIES

LONDON & SCANDINAVIAN METALLURGICAL CO LIMITED

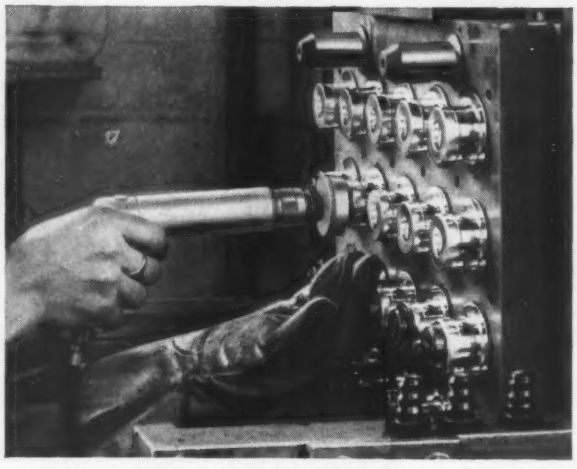
(Tool Division) Wellington Works, Wellington Road, Wimbledon, London, S.W.19 Telephone: WIMbledon 6301-2-3-4

Some people (Desoutter) say that assembly lines would grind to a standstill without Desoutter pneumatic screwdrivers. Certainly many plastic goods would not be put together nearly as fast without these miniature high speed tools. But, you say, you don't put things together. You can't get rid of Desoutter that easily — as you can see below.



Desoutter in the Plastics Industry

Our range of pneumatic and electric tools is nothing if not wide. But should you find a gap, we'll do our best to fill it for you. In certain cases we're prepared to produce an entirely new tool for a specific job. Write for further details of Desoutter tools for the plastics industry.



M13 RP pneumatic drill fitted with a special adaptor for unscrewing plastic bottle stoppers after moulding. Speed, 1,000 rpm. Weight, 1½ lbs.

Desoutter electric oscillating saw used for cutting glass fibre. Makes 18,000 strokes per minute. Will not cut when in contact with soft surfaces or skin.

Desoutter pneumatic and electric tools put power into your hands

DESOUTTER BROS. LTD., The Hyde, Hendon, London N.W.9.
Tel: Colindale 6346. Telegrams: Despnuco, Hyde, London.

CRC297

YOU SAID YOU* WANTED THIS

'This' being a low pressure, high density linear (call it what you will) polythene sheeting. In Iridon LP1300 you have it.

PROPERTIES

High Melting Range of 125°-130°C, enabling boiling or sterilizing to be carried out without adverse effects.
Higher Relative Rigidity than ordinary polythene, allowing use of thinner gauges.
Relatively Higher Tensile strength than ordinary polythene, hence increased durability and strength.
Chemical Inertness makes Iridon LP1300 ideal for anti-corrosion applications.

USES

Thin Gauge Food packaging; bubble packs calling for durability; applications in electrical industries.
Heavy Gauge Ducting; piping; trunking; containers for chemicals; tote boxes; assembly trays; factory containers and bins; baby baths; sink units; draining boards and other domestic applications.

TECHNIQUES

Vacuum forming; welding and general fabrication techniques.

*** If you are one of the few who haven't actually asked us for it—please forgive us. Nevertheless, we're sure that Iridon LP1300 will be of interest and practical value to you.**

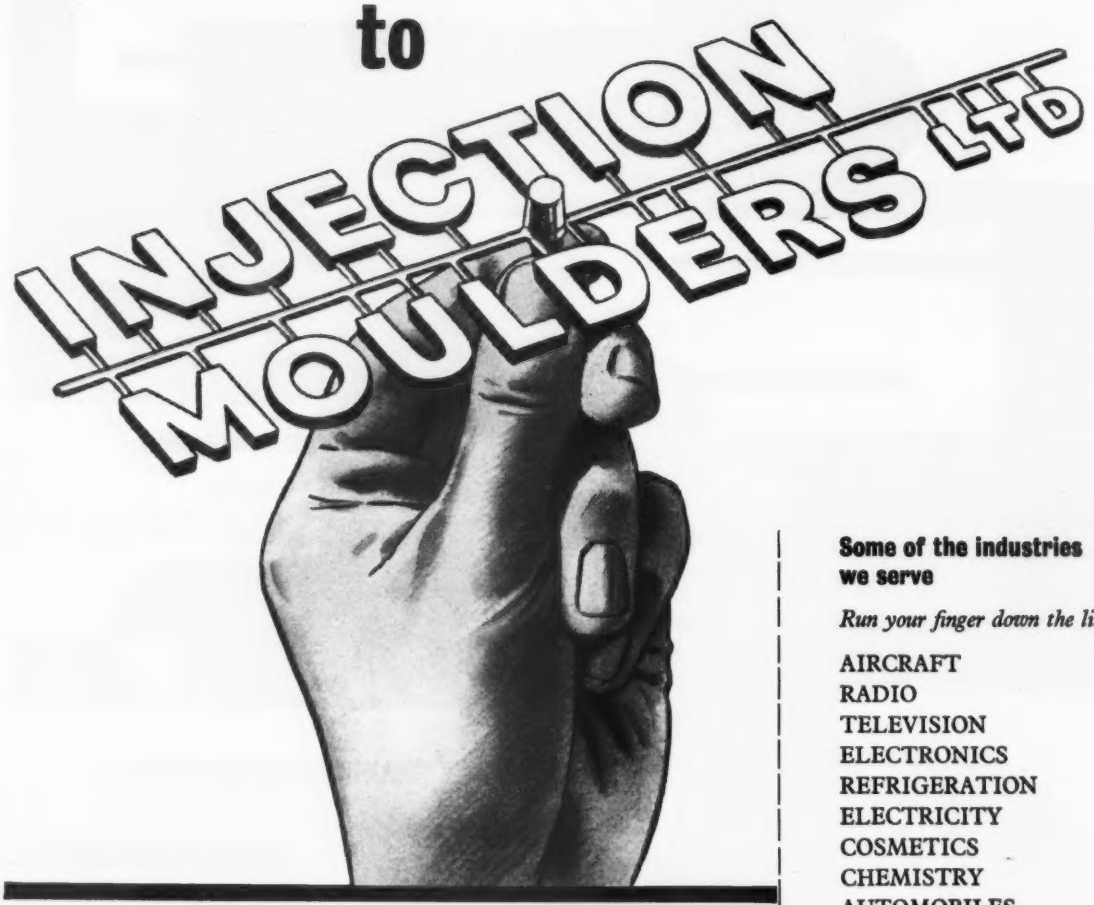
Iridon One of the CP Group of Companies

LP1300 Low pressure polythene sheeting

Full information from IRIDON LIMITED, 1 AVERY ROW, GROSVENOR STREET LONDON, W.1. Telephone: HYDe Park 9261

F

Bring your moulding projects to



You'll be in very good company, for many big industrial "names" come to us for advice and help. We mould for practically every industry you've ever heard of (and some you haven't!) – in cellulose acetate, diakon, methyl-methacrylate, polystyrene, polythene, nylon, etc.

We'll be only too happy to discuss *your* particular injection moulding difficulties.

Some of the industries we serve

Run your finger down the list:

AIRCRAFT
RADIO
TELEVISION
ELECTRONICS
REFRIGERATION
ELECTRICITY
COSMETICS
CHEMISTRY
AUTOMOBILES
TOYS
PHOTOGRAPHY
TELEPHONES
ENGINEERING
BUILDING
SPORTS
OFFICE EQUIPMENT
FANCY GOODS
SHOP FITTING
HOUSEHOLD WARES
ETC., ETC.

INJECTION MOULDERS *Ltd*

Specialists in thermo-plastic moulding for all industries.

WESTMORELAND ROAD, LONDON N.W.9

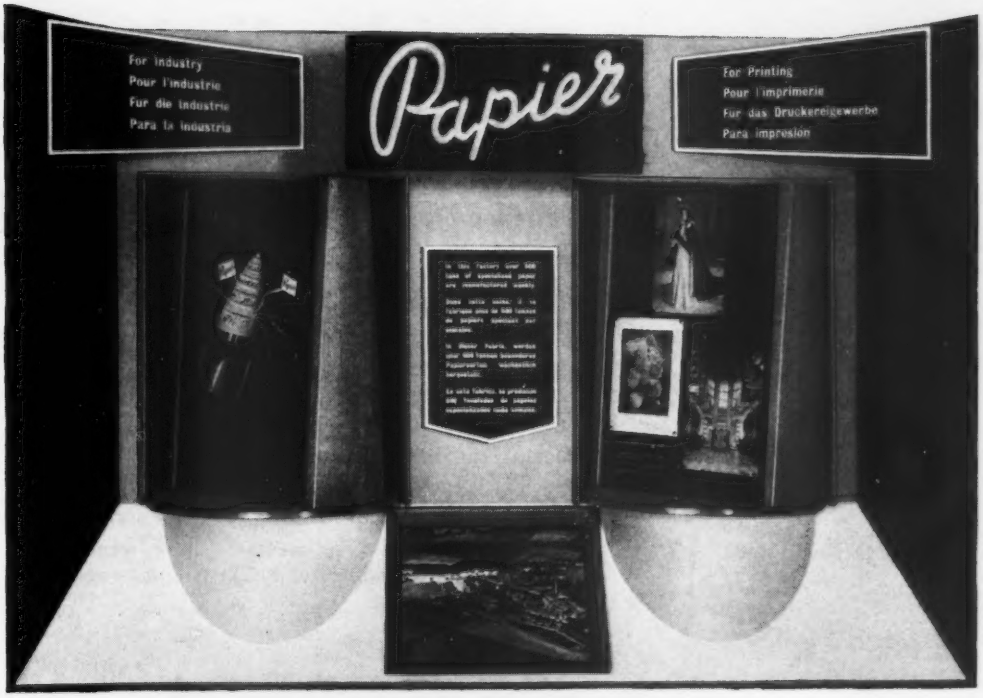
Telephone: COLindale 8868/9 8860 *Telegrams:* INJECMOULD HYDE LONDON

IM60R

The best of Britain's fine papers

on show at the **BRUSSELS EXHIBITION**

A colourful display panel with unique lighting effects, illustrating the many uses of TULLIS RUSSELL papers, is one of the features of the SCOTTISH INDUSTRIES Stand at the Brussels Universal Exhibition. Famous papers for printing... paper for industry and commerce... paper for photography... paper for power and telephone cables... technical papers for plastics and the electrical industries... TULLIS RUSSELL *make them all.* Through their presence at Brussels, TULLIS RUSSELL are serving to remind people from all over the world of 'the POWER of PAPER.'

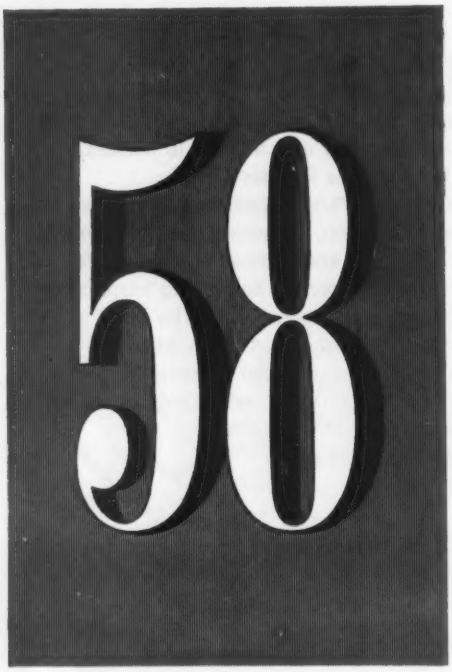


Tullis Russell & Co. Ltd.

PAPER MAKERS SINCE 1809

The Pioneers of Twin-wire Papers for Printers

SCOTLAND	*AUCHMUTY & ROTHES PAPER MILLS · MARKINCH · FIFE*
LONDON	*IVOREX HOUSE · UPPER THAMES STREET E.C.4.*
BIRMINGHAM	*177 CORPORATION STREET*
MANCHESTER	*372 CORN EXCHANGE BUILDINGS · CORPORATION STREET*



★ ★ ★ ★ ★ ★ ★ ★

58 years of moulding plastics to high precision limits for government and industrial applications at your service

Send Us Your Enquiries

Moulders to the Admiralty, Air Ministry, Ministry of Supply, G.P.O., Electricity Boards, and world famous undertakings in all branches of British Industry.

EBONESTOS
INDUSTRIES LIMITED

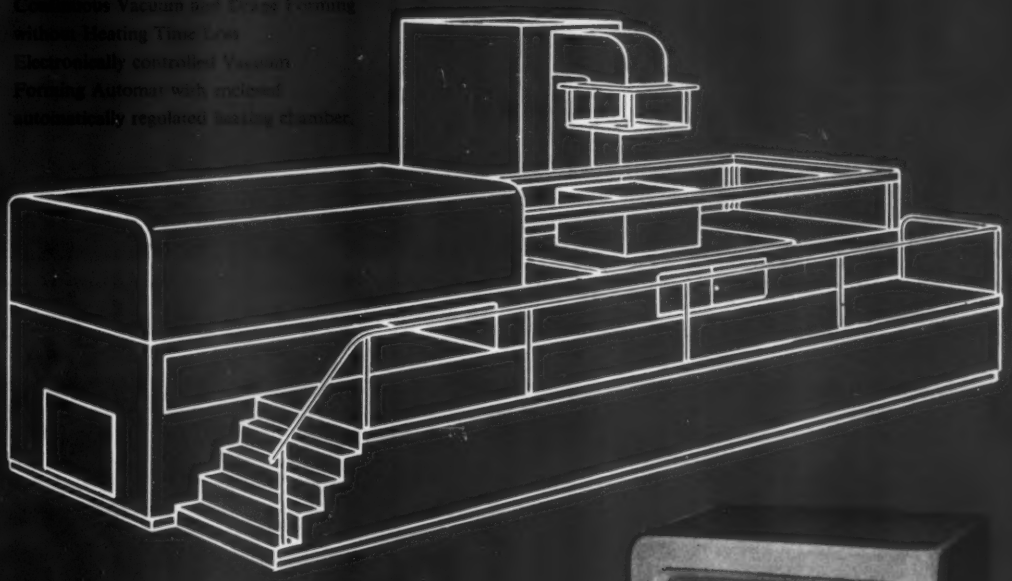
EXCELSIOR WORKS, ROLLINS STREET, LONDON, S.E.15.

Telephone: New Cross 2080 (20 lines)

PLASTIPLAST

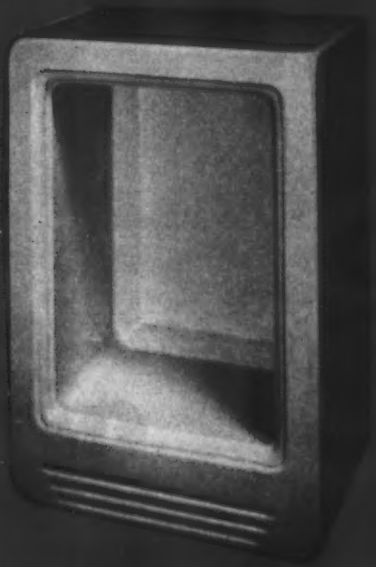
58 MA
"Contraform"

Continuous Vacuum and Draw Forming
Without Heating Time Loss
Electronically controlled Vacuum
Forming Automat with enclosed
automatically regulated heating chamber.



The electronically controlled PLASTIPLAST 58 MA "Contraform" with infinitely variable temperature regulation, represents the highest perfection in the vacuum forming of thermoplastic materials, and fulfills the highest capacity demands.
It represents the optimum at present attainable. It is capable of a wide range of applications for the production of large volume plastic products, especially double-wall formings, up to the size and depth of a bath, etc.

The refrigerator forming of 3-6 cubic feet capacity as shown is produced in one operation from a plastic sheet 40" × 50" × 3/



Vogt and Hartmann

Maschinenfabrik, W. Germany

Sole British agents:

ED. BRAND LTD., (PLASTICS DIVISION)

9 St. Cross Street, London, E.C.1

Telephone: CHAncery 4611 Telegrams: WYBRANDS LONDON

Now there are 4 new SURFORMS

FINE-CUT FILE No. 102

This SURFORM file has been developed specially for mild steel and other tough materials. The cutting principle is the same, but the teeth are set at a different cutting angle, giving a clean cut and a smooth finish. Price **12/6**.—Replacement blades (No. 506) 3/6.

BLOCK PLANE No. 111

This fine-cut tool is for quick, one-handed smoothing of edges and small surface areas on a wide variety of materials. You will find scores of uses for it around your workshops. Price **10/-**. Replacement blades (No. 520) 2/9.

CONVEX PLANE No. 105

Although developed for the car-body repair trade and for spot-trimming, this fine cut convex SURFORM is very fast and efficient on wood too and is ideal for the furniture and cabinet making industry. Price **17/6**. Replacement blades (No. 506) 3/6.

HALF-ROUND FILE No. 103

Here's another tool for which we had many requests. It gives first class results on concave surfaces and will serve many trades. Price **13/-**. Replacement blades (No. 507) 4/3.

The universal tool with hundreds of uses!

SURFORM

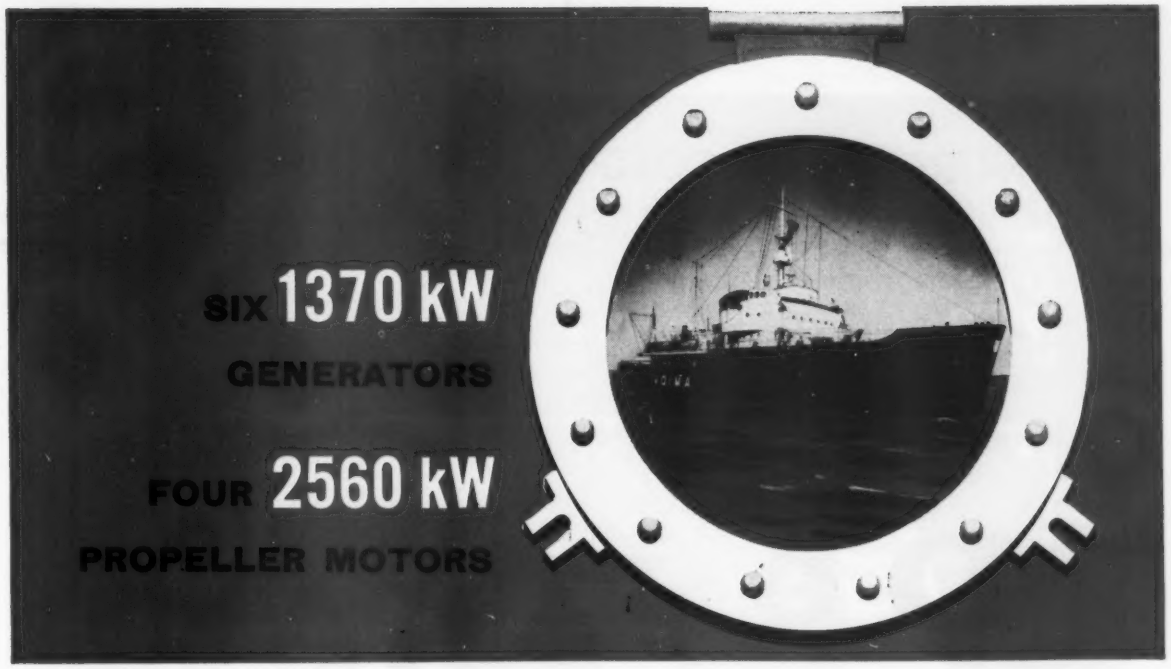
The new tools are supplementary to the original SURFORM plane and file, which remain the ideal all-purpose cutting and finishing tools for every industry. Plane type (No. 107) **17/6.** File type (No. 101) **12/6.** Replacement blades (No. 505) **3/6.**

SURFORM blades (an invention of Firth Brown Tools Ltd.) are made from hardened and tempered Sheffield tool steel—they give controlled depth of cut and never clog with waste material.

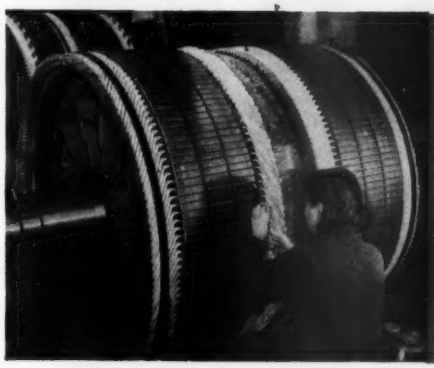
FC

A product of SIMMONDS AEROCESSORIES LIMITED, Treforest, Glamorgan. **A MEMBER OF THE FIRTH CLEVELAND GROUP**

CRC 29 SU



all insulated with M & I materials



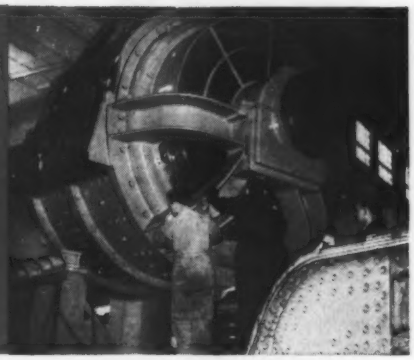
A stage in winding the rotor of one of the six 1,370 kW generators.

Loading one of the propeller motors on to a railway truck for transport to the shipyard.

Photographs by courtesy of —

OY STRÖMBERG AB manufacturers of the main and auxiliary electrical machinery.

WÄRTSILÄ-KONCERNEN AB who built the "Voima".



The Finnish icebreaker "Voima" (4,415 tons displacement) has propellers both fore and aft. She is powered by six direct-coupled diesel-electric units supplying current to her four driving motors, which can develop 10,500 H.P.

The "Voima" has proved so successful under very severe ice conditions that three similar vessels have since been built — and the electrical machinery insulated with M & I materials.

These are the electrical insulating materials manufactured and supplied by M & I for the "Voima" and her three sister ships :—

PAXOLIN synthetic resin-bonded paper and fabric sheets — MOULDING MICANITE for commutator rings, etc. — WOVEN GLASS TAPE — COMMUTATOR MICANITE for segment separators — GLASS SLEEVINGS — MICAFOLIUM — MICANITE PAPER — MICA SILK TAPE.

m and i

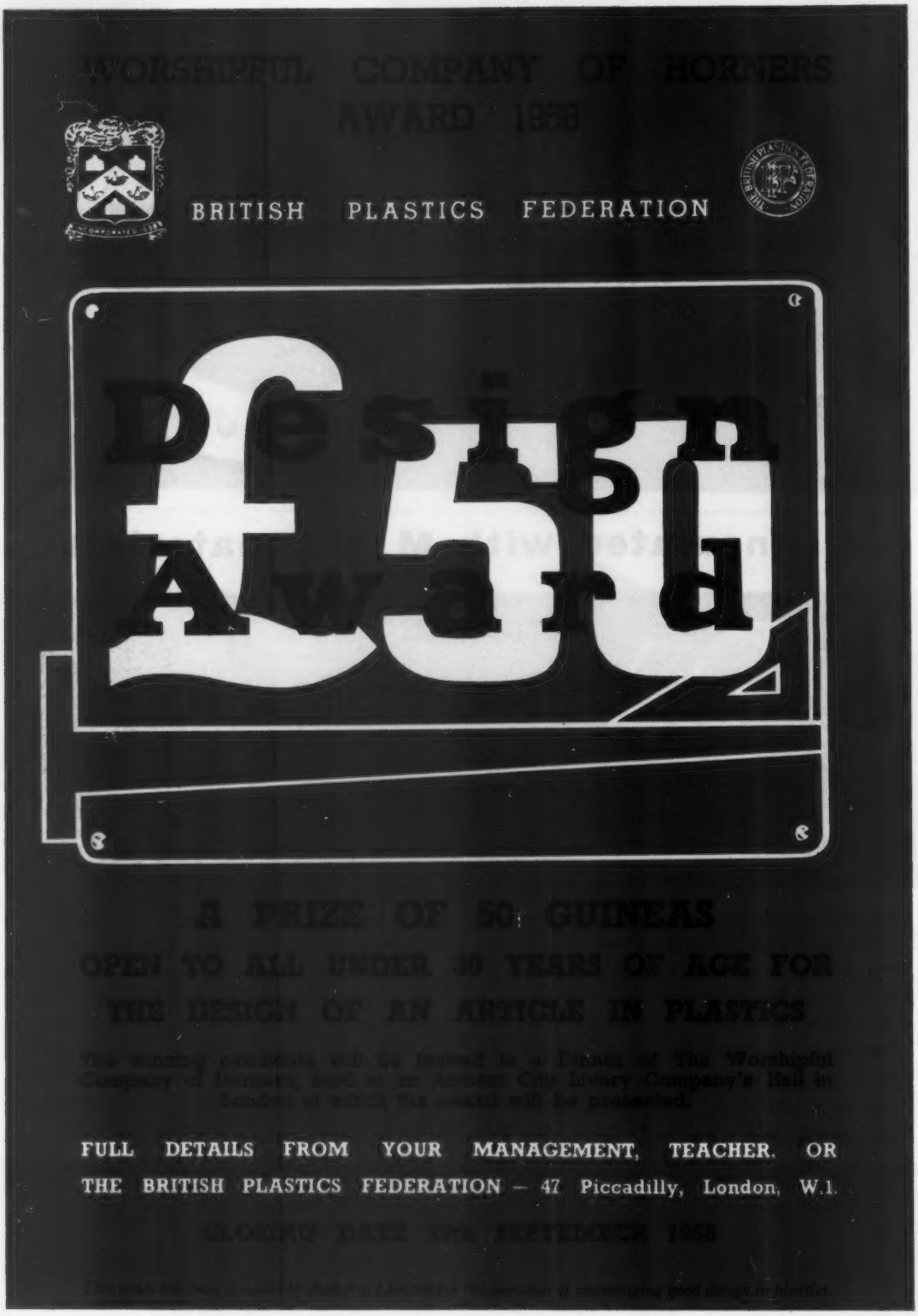
the electrical insulation people

THE MICANITE & INSULATORS CO., LTD.,

BLACKHORSE LANE, WALTHAMSTOW, LONDON, E.17.

Telephone : Larkswood 5500. Telegrams : "Mytillite", Estphone, London.

"Paxolin" is a registered trade name of The Micanite & Insulators Co., Ltd.


BRITISH PLASTICS FEDERATION
£50
Award
A PRIZE OF 50 GUINEAS
OPEN TO ALL UNDER 30 YEARS OF AGE FOR
THE DESIGN OF AN ARTICLE IN PLASTICS
FULL DETAILS FROM YOUR MANAGEMENT, TEACHER, OR
THE BRITISH PLASTICS FEDERATION – 47 Piccadilly, London, W.1.

Plastics

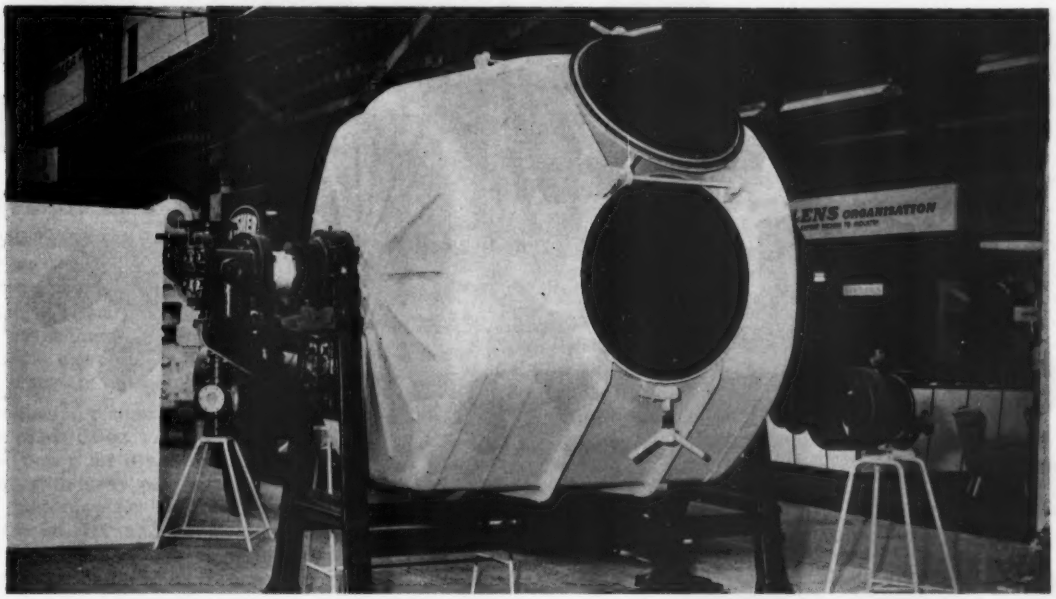
DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

PROPRIETORS: TEMPLE PRESS LIMITED

CHAIRMAN and MANAGING DIRECTOR: ROLAND E. DANGERFIELD

CONTENTS

	Page
Editorials	237
Moulding Powder and Shot	238
Chemical and Petroleum Engineering Exhibition	239
Brussels Fair and Frankfurt Exhibition	242
High Polymer Science and Technology in U.S. and Canada, by J. Glazer ...	244
Vacuum Forming and its Applications, by R. W. Harwood	248
Glass Fibre Spray Process	250
World's Industry Employs Plastics ...	251
New Productions...	253
Talking Shop	256
Burtonwood-Andouart 60mm. Extruder	257
Two Colour Injection Machine	257
The Peco 40M S40 and 40M P50 Injection Machines	258
Celluloid Curing Presses	260
Daniels 30/30 Vacuum Forming Machine	261
Plastics News	262
Automation Equipment	265
Fabric Tanks in Oilfields...	266
Polyvinyl Butyral for Stained Glass ...	266
Capacitative Heating of Dielectrics in H.F. Fields	267
The Use of Plastics in the Button Industry, by P. Vaughan	268
Unpublished Reports	269
Low Frequency Induction Heated Resin Plants	270
The Use of Plastics in Marine Applications	271
Patent Review	273



At the Chemical and Petroleum Engineering Exhibition. Xanthating churn lined with Teflon shown by Thompson Brothers (Bilston) Ltd.

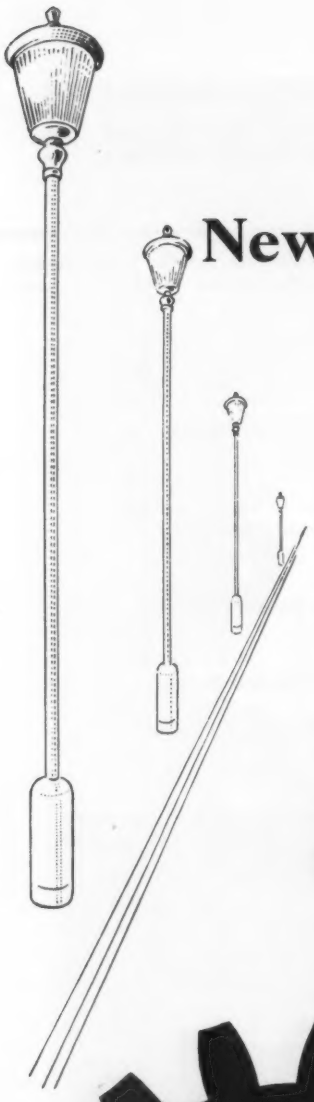
EDITOR: M. D. CURWEN, B.Sc., F.R.I.C.
ASSISTANT EDITOR: C. W. WELCH

Published on the second Wednesday of each month by the Proprietors, Temple Press Limited, and printed in England by Sir Joseph Causton & Sons, Ltd., London and Eastleigh

Annual Subscription Rate 44/-. (Canada and U.S.A. $6.50)

Editorial, Advertisement and Publishing Offices: Bowling Green Lane, London, E.C.1

Telephone: TERminus 3636



A clear transparent Diakon moulding, fluted in a truncated cone, is used in the body of this new G.E.C. post top lantern. Clear Diakon is used also for the moulding at the lower part of the lantern body, allowing light to reach the foot of the pole. This particular application of modern plastics technique was carried out by the Witton Moulded Insulation works of the G.E.C., for the Exterior Lighting Department.

New light on lanterns

But the plastics experts of the G.E.C., with over 40 years' experience to call upon and the whole vast research laboratories of the company behind them, are all the time working with plastics for firms in many industries. They could work for you, too.

G.E.C.

moulded plastics for industry

THE GENERAL ELECTRIC CO. LTD · MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Plastics

VOL. XXIII No. 250 JULY, 1958

EDITORIALS

Chemical Engineering Exhibition

THERE has been only one prior chemical engineering exhibition in this country and never before has there been one dealing with petroleum engineering. The joint affair held at Olympia (June 18 to June 28) was therefore of extreme importance and the significance behind the reason for its jointure still more so.

We cannot now segregate the one from the other for even economically the bond grows stronger with the passing of time. Scientifically and technically there is but little difference whether we consider the once famous and now forgotten Pumpherston oil works ruled over by the even more famous Dr. Young, which produced lamp oil and also ammonium sulphate from shale in the 1870's and after the First World War, or the earliest of topping plants or the most modern refinery comprising vacuum units, catalytic crackers, reformers and hydrofiners and their contemporaneous opposite numbers in the other chemical industries. The boilers are there for steam distillation and so are the acid and soda treatment plants, the vacuum units, the fractionating columns, the catalyst chambers, and the special pumps and lines. We can see the parallel, small or large, whether it is petroleum we are refining or whether we are making margarine, artificial silk, fertilizers, dyestuffs, explosives, coal tar products, pharmaceutical compounds, or polymers for plastics. We even dare swear that the extremely efficient beam engine we saw on one stand at this Olympian exhibition can find one of its ancestors in some works in the country. There was such a one (perhaps not from the same stable!) in a London factory, pumping water for an " allied to chemical " industry, that had functioned admirably for 70 years when we saw it in 1932 and for all we know still does! Fractionating columns have existed in the chemical industry—whether distilling coal tar fractions or whisky or carbolic acid—long before they were employed in the petroleum industry; a filter-press for producing paraffin wax looks exactly the same as the type used for filtering and washing a pigment; no nationalistic fashions affect much the design of a sulphuric acid plant in refineries in Mexico or Kuwait or in a fertilizer factory in County Durham.

The production picture of the petroleum industry brings the industries much closer today. It was in the U.S.A. that the revolution began, for it was there in the early 1920's, that the petrochemical industry was born and by the 1930's the butyl alcohols, iso-propyl alcohol and their compounds with acids flooded the market and swept those solvents made from " natural " compounds and employed in the growing paint industry, out of production. Today we have a host of such petroleum-derived compounds, some completely unknown in the 1930's, to say nothing of highly pure sulphur, pure ethylene and propylene for polymer production, liquids for detergent manufacture, sulphur-free benzene in bulk—the tale seems endless. The growth of the petroleum industry in Great Britain saw a sudden surge forward in the 1940's and to cap it all and to our great relief the petrochemical industry born in 1948, seems a young giant already.

It is often invidious to point out specific exhibits but we cannot help mentioning some special ones that caught our eye. Outstanding was the model of a complete modern refinery on the stand of the Kellogg International Corporation, the famous consultants and contractors in the petroleum and chemical fields. Then, on I.C.I.'s stand we noted components and units of chemical plant made from titanium, the metal that possesses outstanding chemical resistance; it has recently been discovered that small quantities in steel confers excellent properties on the latter in so far as corrosion by vanadium pentoxide is concerned —a fact of great importance in the protection of boiler tubes and heat exchangers when using petroleum oils as fuel. Again we noted the impact of three plastic factories: B.X. Plastics Ltd. showed a working model in Cobex of a fume extraction plant and samples of Stelvetite the new steel-p.v.c. laminate; Chemidus Plastics Ltd. exhibited unplasticized p.v.c. piping up to 15-in. bore and Extrudex Ltd. displayed tubes and fittings, fans and ducting and an excellent constructed acid-fume washing tower complete with tower fillings, all in rigid p.v.c.

If we may be somewhat critical, though constructive we hope: pre-exhibition propaganda was poor compared with those made by other great industrial exhibitions and, furthermore, we sadly missed the central theme we have outlined above. There was no golden thread running through its fabric, for the public, for the schoolboy who is the future customer of and the future worker in these industries, nor indeed for workers in other industries. The function of an exhibition is not merely to keep selling to existing customers but to widen the knowledge available in order to embrace new ones.

Plastics and Engineering

THE plastics industry stands in a special position with regard to chemical engineering for it is obviously both a buyer of metal structures and it has taken its own rightful place in the building of plastic chemical plant especially so far as corrosion-resisting units and components are concerned. The story began when the first phenolic resin-asbestos acid storage tank was first built about 1927—although it will surprise many that celluloid tubing was successfully used as anti-corrosive piping as far back as 1919. Today vast quantities of plastic piping are employed in all refineries, pumps, valves, fans, chimneys, extraction and scrubbing plants are common in chemical factories, in electro-plating works, in the artificial silk industry (the photograph on our " contents page " of this issue of a xanthogenating vessel lined with p.t.f.e. is the latest example), in the steel sheet galvanizing industry and so on, to say nothing of the use of plastic components within the laboratories themselves, as our recent special articles have shown.

This new industry is growing fast and makes a splendid contribution to the whole chemical engineering industrial structure, which now can present a formidable front in this new battle for one of the most important of modern markets. It can, if it wills, stand against the rest of the world, if it still further strengthens its own structure by continually fostering the science and technology of chemical engineering, by continuous and high quality propaganda and by realizing that not only is English the language of the vast Commonwealth, and the U.S.A., but that it is also becoming the second language of the rest of the world, and that technically it is also the clearest of industrial languages.

MOULDING POWDER AND SHOT

Last month I said there was a little war going on about " polythene versus polyethylene." It was nothing but a skirmish, a faint rattling of wooden sabres compared with the fearful plop-plop of dehydrogenated bombs and the scream of misguided missiles that now fall about my ears. And all because I said that the fellows who suggested using " polyethylene " instead of " polythene " way back in 1936 or so, should have their big little souls doctored and that those p.r.o.'s who are now ordered to spread this gospel, should have their little big heads examined. I grovel. I apologize. What I should have said is that the first should have their little big heads examined and that the p.r.o.'s should have their big little souls doctored. I'm afraid I got what the Greeks used to call the ' oxymorons,' all mixed up. Anyway my point is that the p.r.o.'s know or should know everything about publicity, propaganda, the use of words and the best formation of words " to get across " to the public and should have the guts to tell the know-alls at the top where to get off and to stop playing politics in industry. Let me remind them that Du Pont's of America put Carothers' work across to the public by inventing the word nylon and gave it to the world as a generic name. It was accepted willingly because it was so good. The word itself doesn't describe the fibre or plastic chemically and we all know it doesn't matter a hoot. Let them stick to " polythene " and get cracking to prepare for the shinanigan of words they'll be trying to sort out in a few years' time. The throubles have spread to ould Oireland and so they have, begob. Mrs. O'Flaherty goes into the draper's shop just off St. Doolagh's Road and says to the saleslady: " And now Kattleen mavourneen, will you be giving me three and a half yards of that nylon stuff for me new curtins and with what's left over I'll be making a tail to me Danny's shirt, so I will." Saleslady (bursts into tears): " Och, now Mrs. O'Flaherty, haven't I been telling you for months now, you mustn't say nylon. You must ask me for Hexamethylene Adipamide Condensate or the manager will think I'm not being able to teach you to speak the good Eireish and I'll be getting the sack and shure it's back I'll be going to Inishtooskert where there's no dance-hall and not a television within 50 miles. Ochone, Ochone ! " Mr. Paedrig Aloysius Finklebaum comes out of his office, looks severely at his customer and says: " And tell me, Mrs. O'Flaherty, what would Shamus Joyce be thinking of you now if he heard you, which thank heaven he can't?" He stalks back to his office and for the rest of the day we hear only his soul-stirring song:

God save all in this House!

Gra mo chree mo colleen
Sláinte geal mo vourneen,
Gra mo chree mo colleen
Eireann go bra!
Mo Hexamethylene,
Mo Adipamideen,
Eireann go bra!

(And may the Irish forgive me for writing this lovely old song in a sort of English music-hall Erse.)

* * *

Now for some really important news straight from Wentworth Golf Club, when the P.I.G.S. held their usual June meeting. On the whole I thought the turnout less colourful and less daring than last year when Cyril Last staggered his usual crowd of fans by wearing an extremely low-necked lace-edged thingummy-bob and the then new vogue of cunningly slit trouser turn-ups which showed his pale green M. & S. St. Michael's socks. On this occasion some players tried to achieve similar notoriety by colourful splashes of tomato juice on sweaters, coffee stains on trousers and delicate cut holes in trouser seats, but the whole was marred by the too general use of raincoats, overcoats, waders and wellingtons, none of which was in the bright colours I hoped to see. Some presume that this was due to the few drops of rain that fell between 11 a.m. and 5.30 p.m. on this English summer's day. Oh! I forgot the results. Here they are:— " Over Fifties " Competition. Won by F. C. Lynam with 78 nett after a tie with H. A. Brooks who also had 78 nett. " British Xylonite " Trophy. Won by P. Smith and F. C. Pullen who scored 38 points after a tie with T. S. Crabtree and T. V. Boardman. " British Plastics " Trophy. Won by K. G. Butcher with 73 nett after a tie with R. P. Anderson, 73 nett.

Wallowing in the Golden Trough

* * *

I have just received a letter from Donald Norie who has been a Director of Holoplast for very many years. I am sure many of our readers who know him will want to read his news so I am publishing his letter here and a photograph of him (left) with A. N. Other. He has been my friend for many years and has encouraged us all on this journal. May he be happy in his retirement. He has given much happiness and friendship to others :

Norie of Holoplast Retires

"Although you will probably be hearing from other sources of my pending retirement, I am sending this little personal note to tell you that having reached and passed the normal retiring age of 65 years, I shall be leaving Holoplast on June 30.

" This severance from the Plastics Industry is not without considerable regret, as my connection with it covers almost 30 years and if I include the years immediately preceding, spent with the Rubber Industry from 1913–30, it is getting on for little short of 50 years with the Plastics and Rubber Industry, with a break only during 1914–18 when I was serving with the Forces.

" It is only natural, I suppose, at a time like this for one's mind to dwell in retrospect, and at the moment I recall very clearly the first issue of the second Journal devoting itself entirely to the Plastics Industry. Was it not said that the Plastics Industry was not big enough for one Trade Journal! That was 21 years ago; in fact, I believe you celebrate your 21st birthday this month, and with this, I send you my best congratulations. Since then, much water has flowed under many bridges and I know you must have thought many times of those early ' tempestuous days ' and at the same time felt happy that your efforts have been more than justified. Certainly your Journal has more than established itself for its highly respected and authoritative views wherever plastics are discussed.

" My association with the Plastics Industry has been a very happy one and I value highly the many friendships that I have made during those years and which will mean much to me in the future. Although I shall no longer be with the Industry, I hope that there will be many opportunities for us to meet and talk over the old times.

" With thanks for your many kindnesses to me and with all kindest regards and best wishes for the continued success of your Journal."

DOGSBODDY.

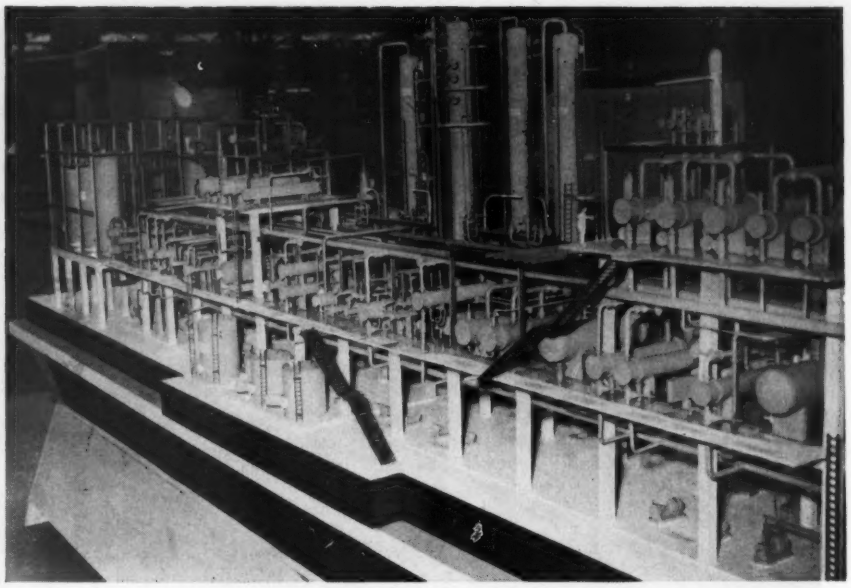
Chemical and Petroleum Engineering Exhibition (Olympia, June 18-28)

PETROLEUM, petrochemicals and plastics besides all having the same initial letter are closely allied to each other, and in fact the very existence of the plastics industry is dependent to a large extent on the petroleum industry. This dependence will in the future be increasing and it is on this premise that we regard the first petroleum and chemical engineering exhibition as one of importance.

Important though it may be it was nevertheless rather disappointing from the plastics point of view. Much has been said both here and in America on the use of plastics for piping and other applications in the petroleum industry and this exhibition should have been a good opportunity to show what plastics can offer in return for the assistance the petroleum industry is giving to their existence. Piping was shown by a number of companies but it was not the high pressure glass reinforced piping which was reputed to be of such value in refineries and oil fields. It was extruded tube in p.v.c., nylon, Kralastic and polythene. The companies showing this type of piping were Chemidus Plastics Ltd., 26 Progress Way, Purley Way, Surrey; Extrudex Ltd., Western Road, Bracknell, Berks.; Yorkshire Imperial Metals Ltd., Leeds, Yorkshire; Barflo Ltd., Cavendish Place, Eastbourne, Sussex; and H. Incledon & Co., Ltd., Winnock Works, Winnock Road, West Drayton, Middlesex. The latter two companies were exhibiting Durapipe which they do not manufacture but install. Pipe protection, however, was featured by three companies and it would appear that this is of some importance to the oil industry. Smith & Nephew Ltd., Bessemer Road, Welwyn Garden City, Herts., showed a range of self-adhesive p.v.c. tapes, whilst Winn & Coales Ltd., Denso House, Chapel Road, London, S.E.27, showed their Densopol tape which is a glass tissue felt filled and coated with Densomatrics and backed by a film of p.v.c. Three grades of p.v.c. backing, two plasticized and one unplasticized in different thicknesses are available and they have been used extensively on oil pipe lines. The other company showing pipe wrapping was Fibreglass Ltd., Ravenhead, St. Helens, Lancs.

An interesting example of the combination of plastic materials with older products was shown by Hathernware Ltd., Loughborough, Leicester. A new armoured stoneware pipe and valve marketed under the trade name Fibresin has a protective covering of glass cloth and epoxy resin. In this way it has been found that the inherent weaknesses of stoneware can be overcome without increasing the cost or losing any of their special chemical properties. It is interesting to note that in attempting to armour their pipes and valves Hathernware tried to use a steel-clading, and although this was successful the corrosion problem became very serious and in many cases the cost prohibitive. The valve has a porcelain plug operated in an inclined position by a handwheel mounted on a screw spindle. The plug is fitted with a Fluon cap to ensure perfect seating with a minimum of pressure on the screw. The malleable iron flanges are cemented to the outside of the valve by the resin used.

Chemical plant in plastics was featured by B.X. Plastics Ltd., Higham Station Avenue, Chingford, London, E.4, who showed many uses for their p.v.c. materials, in particular the Terylene and metal reinforced grades of Cobex. In addition they exhibited examples of formed Stelvetite p.v.c. clad steel sheet. Another company whose principal exhibit was p.v.c. frabrication was Extrudex Ltd., Western Road, Bracknell, Berks., but on this stand one of the most interesting things was their new range of pipe fittings which they are now moulding. An impressive display by Mendip (Chemical Engineering) Ltd., Luton Road Works, Dunstable, of glass reinforced polyester resin pans of 154-gallons capacity, a 48-in. diameter pipe and a light-weight vacuum filter



Kelloggs complete model of the ethylene plant for Petrochemicals Ltd.

gave some indication of the use of this material where large plant is to be used in corrosive conditions. Another company showing resin glass laminates was Prodorite Ltd., Eagle Works, Wednesbury, Staffs., who showed their new Orglas. This is available in four grades which between them offer resistance of most organic acids, alkalis, salts and solvents. This company also showed p.v.c. fabrications for which they are well known.

Two further applications of plastics besides a number of valves being shown was a large xanthating churn whose interior had been lined with Teflon. This was shown by Thompson Bros. (Bilston), Ltd., Bradley Engineering Works, Bilston, Staffs., and a selection of drum liners in polythene were shown by Metal Containers Ltd., 17 Waterloo Place, Pall Mall, London, S.W.1. The latest of these was the Valethene 45-gallon container which has an outer drum manufactured in 18-gauge steel and an inner moulded polythene container with two moulded-in filling necks. The drum is fitted with polythene bungs and washers with heavy buttress threads and incorporate an inner thread into which polythene bungs and washers are fitted, this provides a vent for emptying and takes the special polythene taps also available.

Plastics Machinery

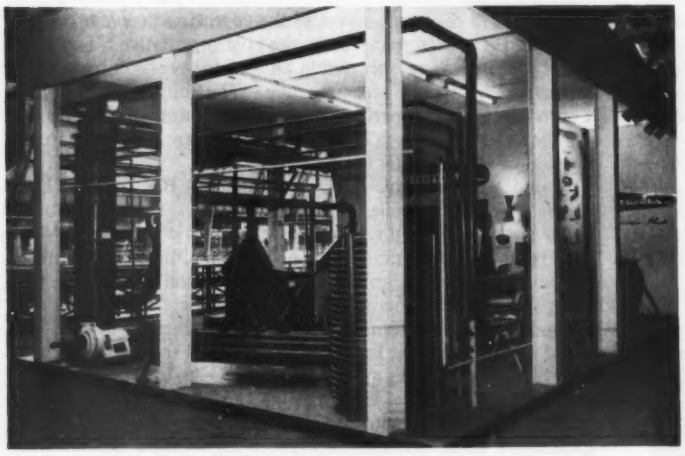
Plastics machinery was shown by Baker Perkins Ltd., Westwood Works, Peterborough, and Burtonwood Engineering Col, Ltd., Burtonwood, Warrington, Lancs., the latter company was showing a new 60-mm. extruder, a description of which appears on page 257 of this issue and a vertical feed dicing machine which was featured in the June issue of *Plastics*, page 225. Baker Perkins Ltd. showed their extruders, of which the 3½ in. has now been modified so that the drive is outside the extruder and not inside the base and the motor h.p. has been increased to 50. The standard coupling used is a Heenan and Froude Dynamatic.

In an earlier paragraph we discussed tubes being shown at the exhibition and also the wrapping of metal tubes with plastics. An interesting exhibit by Marston Excelsior Ltd., Wobaston Road, Fordhouses, Wolverhampton, was a combination of these two, namely a heavy gauge polythene tube reinforced by wrapping with glass fibre bonded either by polyester or epoxy resins. Unfortunately at the time of going to press we have not got any figures on the properties imparted by this type of reinforcing but obviously the polythene tube will now be able to withstand much higher pressures. Whilst on the subject of glass fibre one should mention a new application for this type of laminate in the large fan blade which is used to circulate the air on the new Solo-Aire heat exchanger, a model of which was shown by A. F. Craig & Co., Ltd., Caledonia Engineering Works, Paisley, Scotland. The lightness of the material plus their corrosion resistance makes this an excellent application for this type of plastics.

Plastics Models

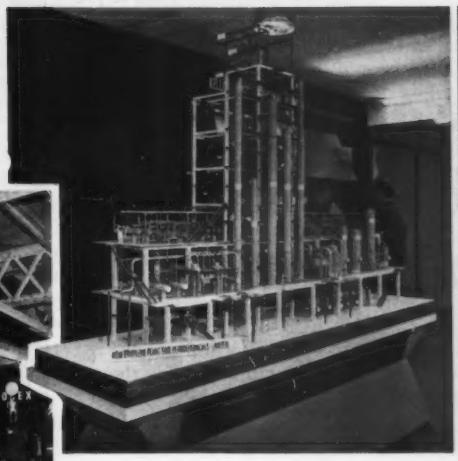
Finally, a report of this exhibition would not be complete without a note on the part plastics are playing in the design of chemical plant. This was abundantly apparent on the stand of Kellogg International Corpn., 7–10 Chandos Street, London, W.1, who showed two large models of the Shell ethylene plant for Petrochemicals Ltd. at Manchester. These were not exhibition models but were in fact used in the design of the plant. The models are made up from moulded and extruded polystyrene parts each accurately scaled and simple to assemble so that the designers can build up the plant and ensure that valves are accessible and that there is room for the pipe work and that the whole is functional. For the larger columns such as the fractionating columns, distillation columns and heat exchangers, foamed polystyrene is used. Being self-coloured it is easy on the finished model not only to trace the processing pipes but also the service pipes. It is hoped that in a future issue we shall be able to give more details of this type of engineering model construction.

(*Further details of exhibits will be published next month*).



Extrudex Ltd. Cooling coils, acid fume extraction plant, and (left) acid scrubbing tower.

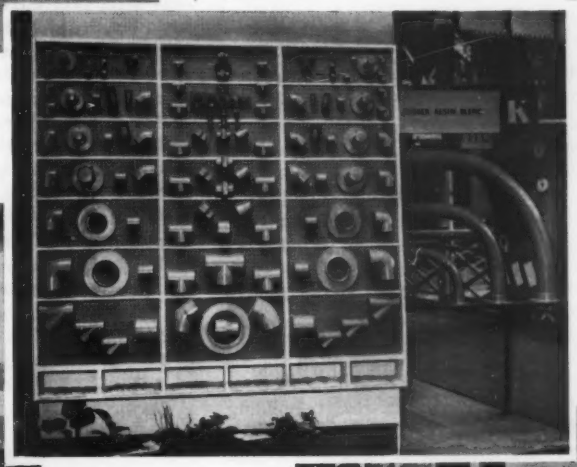
(Right) Plastic model of new ethylene plant for Petrochemicals Ltd. Shown by Kellogg International Corporation.



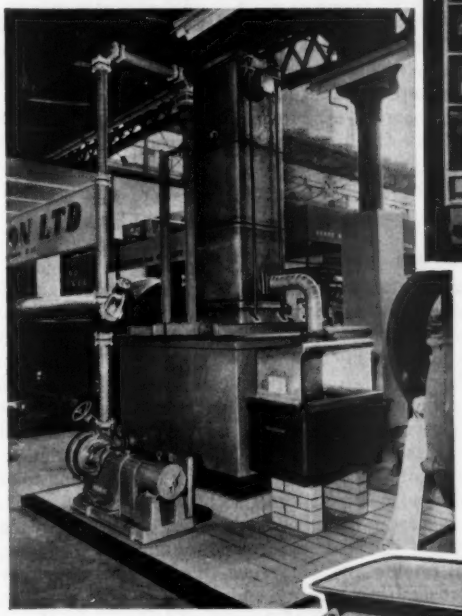
(Below) BX Plastics Ltd. exhibited Stelvetite steel p.v.c. laminate and Cobex chemical structures.

(Below) Pipe fittings in Kralastic shown by H. Incledon and Co., Ltd.

(Above) Metal Containers Ltd. are now fabricating drums within drums—the outer of steel and the inner of polythene complete with bungs and washers.



(Below) Hathernware Ltd. have adopted Fibresin (glass-fibre/epoxy) coatings to protect stoneware plant.



(Below) Prodorite are producing a range of tanks and other units in Orglas (resin glass laminate).

(Above) Mendip (Chemical Engineering) Ltd. have advanced greatly in the reinforced resin structures. Above is seen a 48 in. diameter pipe section.

Right: Belgian company uses acrylic sheet to publicize radio valves.

Brussels Fair and Frankfurt Exhibition

YOUR Correspondent reversed the old motto and put the pleasures of Brussels first, in order the more to enjoy the business of the European Chemical Engineering Exhibition in Frankfurt.

There will be many reports about Brussels and we shall confine ourselves to news of technical and aesthetic interest. The city of Brussels has had its road system drastically improved by the addition of underpasses at the main traffic intersections and a long cantilevered road above the tramways leading to the exhibition. These improvements will be a permanent reminder of World Fair 1958—at least to those whose nerves survive the skilful brinkmanship of the local cab drivers: we can recommend the bus service, cheap, fast and without frills.

The Nationalists and Internationalists have their Way!

The varied nature of the national and thematic pavilions was of some architectural and technical interest. The Belgian Congo buildings were noteworthy for their sense of integration with the exhibits, for the beauty of structural design and the striking use of their lovely woods as constructional—and native matting as decorative—materials. The Congo Mining Industries were presented in an awesome, semi-circular battlement in burnished copper blocks which, in the setting sun, struck a shiver in its reminiscence to some awe-full metallic Aztec sacrificial altar described by Mr. Prescott.

Through the park, under the Swiss-built passenger cable cars in gay colours and Perspex-roofed, past the aluminium spheres of the Atomium, one strolls between the national pavilions in all their contrasts. Austria—a square, hard but effective building, carried on four girders with no ground floor and mounted overhead like the curtain wall of some American skyscraper truncated at the first and only floor. Opposite, on a green bank, an effervescent castle represented San Marino and next came the austere lines of the wooden Finnish and the wood-and-stone Norwegian halls.

The French structure was vast, aluminium clad and intended to be supported on a monstrous set of radial struts extending outwards from one ferro-concrete pivot. The opposing masses of the struts and building were supposed to balance. The presence of many wires and workmen suggested that all was not well with the equilibrium. The building itself looked like the high scenic railway at Margate and, had it been a chemical plant, its ugliness might have been excused in the face of a compelling process requirement. Here, it did no justice to the talents of French engineering. Technically, it was ambitious: it failed, but even had it succeeded one would have doubted the point of such ugliness. A far better example of the art of equilibrium was the civil engineering structure itself, a long ferro-concrete snout pointed menacingly at nothing in particular. It must have been quite a feat to erect.

Across a pool and a display of fountains lay the Russian and American buildings—cool modern white exteriors; the former an enormous rectangle with beautifully light girder work clad in opal glass, the latter a lovely circular pavilion, diamond latticed clad in transparent rigid p.v.c. sheet (see *Plastics*, June 1958, page 218). Both buildings were, on the whole, successful, the Russian marred by an apparently unnecessary garland on the roof, as if to hold vast slogans which at the last moment were mercifully left off. The American was an airy hollow circle, with a central copper-coloured funnel reflecting the light and the rain into a central pool.

The British had two pavilions, one official and an industrial one sponsored by the F.B.I. To this observer the exterior of the former, with three garish tetrahedrons symbolic of something, did not do justice to the success of the interior presentation. Most countries showed aspects of their daily life and surroundings in pictures, the British had a majestic difference, ours were shown in colour transparencies and in captioned film strips. Of course these required darkness to view them properly and this gave a reverential air to our hall, the better to be impressed by the Annigoni portrait of the Queen and by the regalia of the Lord Mayor of London and the like. The industrial hall was like any collection of prestige stands at home.

A tour of the national exhibits inclines one to accept without wonder the ability of all countries to make complex machine tools, one larger than the next and a very similar assortment of rather dreary, but no doubt admirable, industrial gear of all types.

Mixed Exhibits and Mixed Feelings

Specific impressions include: a thought that Michael Faraday must have been an employee of Imperial Chemical Industries; that America has cleverly taken for granted her industrial might and shown herself as a gay country to grow up and live in, with a display of lavish kitchen and sports equipment; the Russians have not yet got over their " Monumental Statue Era " and that they are their own worst showmen, with a garish display of souvenirs like prizes at Hampstead Heath on bank holidays, their cars were more American than Detroit's contrasting their delightful theatrical exhibits; the Czech was a faithful cross-section of safe respectable satellite existence grafted onto the liberal tradition of the Protestant revolution and onto the gay, lovely musical erudite city of Prague, the loi surrounded by slogans of unbelievable banality and dubious Marxist value, ascribed to various luminaries of the present regime; the Dutch are proud of their knowledge of hydraulics and show an enormous Archimedean screw, fascinating to those interested in extrusion pumps; that Radio Luxemburg is more important to the Duchy than iron steel or coal.

Apart from the national exhibits there were special ones devoted to particular themes such as electricity, transport and a particularly fine one on Fifty Years of Modern Art, with loans from many countries and an extremely well presented International Hall of Science. Here each stand was given to a particular piece of research. There were many molecular models, a display of Russian plasticizers for p.v.c., noteworthy because some powerful perfumes of apparently acceptable bouquet also

resulted from the same compounds. Of great note was a working glass laboratory continuous plant making polythene by the Ziegler route. This was staged by Hoechst.

Finally there were a few pavilions unashamedly advertising individual companies. These seemed out-of-place, from the pointless futurism of an edifice placarded " Phillips," via an empty Dexion structure to the tastelessly draped building showing the Solvay Empire with some dull p.v.c. articles to represent their plastics.

There was a good deal of Perspex used and also much reinforced polyester sheet. The latter compared badly æsthetically with the skilfully used natural materials. This particular plastic is perhaps not the nicest looking and certainly a much higher design standard will be required before plastics compete in looks.

Chemical Engineering at Frankfurt

The Achema exhibitions began somewhere about the year 1927 and even then showed the strength of Germany's chemical engineering industry. It was then, I believe, that the first phenolic-asbestos acid storage tank, the first plastic tank used for holding as much as 500 gallons of acid, was first seen. From then on subsequent Achemas have gone from strength to strength, so that I was very expectant of my visit.

Achema is vast. Plastics and their associated special equipment appeared only here and there in the huge range of chemical plant and machines. As expected, there is rather more Ziegler polythene on show, some made up into carboys and fans and ducting previously well-known in rigid p.v.c., which was again shown in these forms. The largest of these p.v.c. structures was a bubble plate complete with caps for refinery duty. P.t.f.e., which has made only slow progress in Germany, is now to be seen in a full range of duties comparable with British practice. There was a small American pump made by Vanton with a p.t.f.e. body and all moving parts in contact with the medium available in a wide range of plastics.

There was very little new to be seen in the way of plastics machinery. Alpine showed their standard range of crushing machinery and the high speed extruders which their designer, Dr. Erich Beck, has developed very quickly to a commercial stage for a number of plastics. A 90 mm. diameter machine turning at 700 r.p.m. is nearly ready and will be the largest of this family of machines. Also from the brain of this able young engineer is the mixer which performs so well in the manufacture of preplasticized p.v.c. powders from liquid and powder constituents. This machine was sold by Alpine to Henschel, who have made a rapid success in many parts of the world with it.

There is some news of interest in compounding machinery. Werner and Pfleiderer, as reported in last month's issue, have developed a new continuous machine—the ZSK. It has two screws, one mounted above the other. It can be fitted with vacuum extraction and with a die-face cutter for pelletizing. Only one size is now available. 83 mm. screws and 700 mm. long. The output is in the medium range, 200–500 lb./hr. dependent on the plastic. A bigger machine, 150 mm. by 1,200 mm., is due later this year with more than twice the output. One of the virtues of the construction is that the screw sections are splined onto a central shaft, making for easy replacement. In this way different combinations can be obtained to give various effects which may be needed for different plastics. The machines should compete in versatility, price and performance with the Welding Engineers of U.S.A. machine—long the Rolls-Royce (or should one say Cadillac) of continuous process compounders.

There was a new Buss Ko-Kneader, 400 mm. in diameter and very, very long. This company has now designed a stronger range of gear-boxes, this should be good news for those who wish to take advantage of the excellent mixing ability of these machines in duties which demand heavy loading.

A newcomer has entered this field, Hans Zimmer of Frankfurt. This company offers a range of conventional, well-built twin-screw extruders, fitted with vacuum extraction. The smallest of these machines is the same size as the largest of the Colombo-Windsor and Pasquetti machines and their largest has a claimed output of 400 lb./hr. of rigid p.v.c. The machines may be used as extruders of sections as well as for mixing; simultaneous extrusion of two rigid p.v.c. pipes was shown in their up-to-date works. Good homogenization and colour dispersion is claimed by the all-too-common method of quoting major customers as " satisfied." A greater degree of confidence would exist all round if machine makers would study the theory of mixing, decide on a few of the critical tests in the range they operate and offer their own testing facilities and results.

This company has built a unique position for itself in the synthetic fibres business. It employs staff on work normally only done in the large chemical companies and has developed from scratch complete processes for continuous polymerization of caprolactam together with the equipment for spinning it. The company is therefore able to offer complete plants to all comers without restriction. Research is now proceeding to extend their experience to polyesters. Several other interesting things are also available from this source, including a continuous air dryer for p.v.c. powders and a very sensitive viscometer operating over a wide range.

Irwin Kampf had a display which was only a token of their impressive experience and ability to wind, slit and re-reel plastic films of all types. In polyester film handling they are probably unrivalled—at least on this side of the Atlantic.

In general, this Correspondent felt that Achema is too big and contains too much machinery which has appeared for years on the sales range of the makers and in such shows. These shows tend to become convenient meeting places for suppliers and customers who can see each other without the expense in time, money and alcohol involved in these exhibitions. It would seem worth making up one's mind whether Achema should exhibit only genuinely new things and services or whether it should be unashamedly a selling Fair. Sorting out the new from the commonly available is a very tiring business in the present show.

Internationally the talk is of disarmament: industrially, perhaps, a campaign for the limitation of exhibitionism might pay, particularly in the price of equipment.

It is with regret that criticisms must also be made of the lecture presented at Achema. Some made an excellent job of reviewing briefly the position of research in a particular field; such as the lecture by Dr. Idris Jones, the Scientific Director of the National Coal Board who spoke on recent U.K. work on the thermal treatment of coal. Some of the German lectures also presented useful work. It was from America that the disappointments came. In a lecture with the imposing title of " The Rate Process Concept in the Chemical Industry " a professional audience surely deserves to be told a little more in half an hour than the fact that the " concept " consists of taking the first differential of the measured quantity with respect to time. It is true that the lecturer did reiterate his point several times by saying it applied to heat transfer and liquid flow problems.

Again, a lecture on methyl methacrylate developments might with advantage go beyond the bare facts that it is transparent when polymerized and that it can now be obtained in isotactic form. We also deserved a little more than a condensed version of the firm's elementary sales literature on p.t.f.e.

It seems here, too, that the remedy lies in not exposing for the sake of exposure. Let us have either the novel—or else a general review of a field for the non-specialist. As it is this Correspondent is ready to believe that many organizations employ people who do little else but travel from trade fair to convention churning out the same old hack lecture, far removed from their company's research or production activities. Such an impression at Achema has obviously been gained from very few lectures. It is possible that those singled out for criticism were well below the general standard, in which case the plastics industry has not been well represented.

High Polymer Science and Technology in U.S. and Canada

By J. GLAZER,* Ph.D.

This is the final instalment of this series of articles by Dr. Glazer. The previous four parts have been published in the March, April, May and June issues under the title "High Polymer Science and Technology in the United States."

THE American rubber industry has, over the last 10 years, sought to break through the restrictive influence of the automobile industry and expand into plastics and fine and heavy chemicals. As a result, the rubber processing industry has achieved a measure of prosperity that was undreamed of in the depressed 'Thirties, and has developed such a range of materials and products that it need never again find itself in a position of complete subordination to the whims of the Detroit car-makers. This policy of diversification, now vindicated by the comparatively healthy position of the rubber industry while the automobile industry is experiencing a depression, has not been limited to the output side of the industry. That is to say, the rubber processers and consumers have also sought to develop fresh sources of raw materials and, indeed *new* raw materials, so as to obtain a degree of independence on the input side that was not available to them previously. Certain types of wild rubber were re-appraised, Henry Ford decided to produce his own rubber and established a rubber plantation in Brazil while the U.S. Rubber Company started its own plantations in Malaya and Sumatra and the Firestone Tire & Rubber Company did the same in West Africa. All of this took place in the years between the wars when there was, for the most part, sufficient natural rubber available to all. The trouble at that time, as far as the United States was concerned, was not that rubber was scarce but that its production and distribution was in non-American hands and, consequently, its price was completely beyond the control of the American rubber-consumer. During this period, variations in the price of natural rubber were so violent that at one time, in 1932, it was selling at three cents a pound ! In this situation no industry could feel secure when its primary basic material was subject to such wild fluctuations in price and it was in the hope of securing some degree of control in stabilizing the price of natural rubber that the large scale consumers went into plantation development. However, labour costs and climatic conditions directed this development towards South East Asia—with the exception of the Firestone plantations in Liberia—and soon after Pearl Harbour, when the Japanese overran 90% of the world's rubber plantations, the American rubber industry found itself virtually cut off from all supplies of raw rubber and with a war for survival on its hands.

* Senior Lecturer in Polymer Chemistry, National College of Rubber Technology.

Synthetic Rubber

Fortunately, some sections of the American rubber and petroleum industries had already been experimenting with, developing and even manufacturing small amounts of special-purpose synthetic rubber and the Government's Rubber Reserve Company, in the spring of 1941, had authorized Firestone, Goodrich, Goodyear and U.S. Rubber to go ahead with the construction and operation of four plants capable of producing a total of 40,000 tons of general-purpose synthetic rubber per annum. This target was increased during the following 12 months to 70,000 tons and the battle for synthetic rubber was on in earnest with the result that, during 1944, 670,000 tons of general-purpose (butadiene-styrene) synthetic rubber was produced in addition to almost 100,000 tons of special-purpose synthetics. Just how timely this was, can be gauged from the fact that the American stockpile of natural rubber had shrunk to a mere 90,000 tons in 1945 ! At the end of the war, the U.S. Government reconsidered the whole problem of the continued production of synthetic rubber. At this time, natural rubber was being consumed at the rate of just less than 120,000 tons per annum while

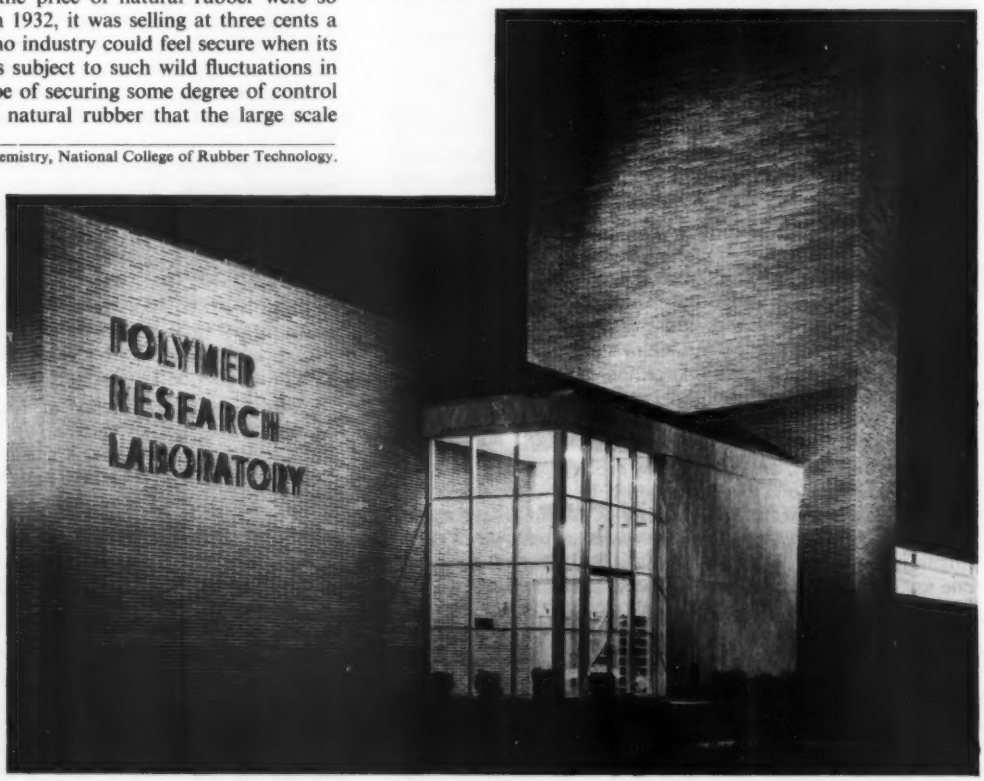


Fig. 1. Impressive architecture at the polymer research laboratory of the Polymer Corporation Ltd., Sarnia, Ontario.

synthetics were running at 700,000 tons per annum, and it was clear that fresh legislation was needed to decide the future of synthetic rubber in view of the reavailability of natural rubber. Should the Government retain its ownership of the synthetic rubber plants ? Should the rubber consumer be allowed free choice between natural and synthetic in a free market ? Would the military security of the United States be prejudiced in the event of natural rubber being preferred on economy grounds ? Would private industry purchase the Government-owned plants and, if necessary, operate them at a loss ? All of these problems had to be considered and it was not until 1948, when natural rubber consumption had jumped to over 600,000 tons per annum and synthetic consumption had dropped down to 450,000 tons per annum, that the Government announced its future policy. It was to ensure the continued production of, at least, 220,000 tons of synthetic rubber per annum. At the same time, the Government was to maintain a production capacity of 650,000 tons per annum, so that in a national emergency there would exist facilities for almost trebling the rate of production. Furthermore, it was recommended that steps be taken at Congressional level to secure the eventual sale of the synthetic rubber plants by the Government to private industry.

However, it took five years for Congress to enact the necessary legislation and, in 1953, an Act was finally passed allowing the Government to attempt to sell its plants. By this time, the Korean War had occurred and synthetic rubber consumption had shot up to almost 800,000 tons per annum while natural rubber consumption had dropped slightly to 550,000 tons per annum. Surely this was the ideal time for the Government to get a good price for its synthetic plants. Yet the " Big Five " of the rubber industry were extremely hesitant, for a variety of reasons. One of the reasons was that the Government insisted that the potential purchasers buy sufficient plants to maintain a production capacity of *at least* 500,000 tons per annum and that this capacity be maintained, for security reasons, for ten years. Another reason was that by the time private industry put in their first bids, in 1954, there was a great deal of uncertainty in the synthetic rubber market. The price of general-purpose synthetic rubber was less than natural rubber and the plants were operating at less than two-thirds of capacity, indeed three of those being offered for sale were virtually standing idle. But this situation did not last for long. In the spring of 1955, the automobile industry leapt out of its depression and the price of natural rubber climbed to a peak value of 50 cents a pound in the autumn. During this boom, the price of general-purpose synthetic was maintained by the Government at 23 cents a pound and the consumption of all types of synthetic rubber reached a record value, in 1955, of 900,000 tons. And very soon the plants were producing synthetics at a level 15% above their rated full capacity.

The U.S. rubber industry soon shook off its hesitancy and scrambled to buy the Government's plants. Goodrich-Gulf Chemicals bought the then largest available synthetic plant for $11 million. This same plant had not received a single bid during the negotiations of 1954. Furthermore, companies having no direct interest in rubber processing made substantial offers and subsequently bought synthetic rubber plants. For example, the United Carbon Company bought a plant in Texas for the sum of $7 million. For this plant, the Government had received—six months earlier—a solitary bid of only $2.5 million, which it turned down. In all, private industry paid $285 million for 26 plants and, in this way, the Government recovered the whole of the losses incurred during its subsidization of the synthetic rubber industry. But this was only the beginning. The enormous demand for synthetic rubber stimulated the new owners of the monomer and copolymer plants to add to the size of the existing plants and to plan and build new ones, with the result that, at the end of 1957, the overall capacity of the synthetic plants was more than 1,500,000 tons per annum, and more than 1,100,000 tons was in fact produced during that year.

From the three oil refineries in the neighbourhood are piped

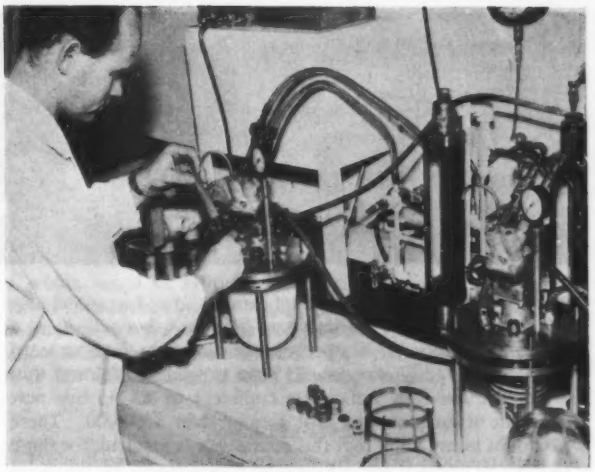


Fig. 2. A sample of an experimental synthetic rubber latex being withdrawn by means of a hypodermic syringe from a small glass laboratory reactor.

supplies of ethylene (for styrene manufacture), *n*-butylenes (for butadiene) and isobutylene (for butyl). Ancillary chemicals are also easily obtained from nearby chemical manufacturers, while American coal is delivered by ship from Lake Erie via the St. Clair River. This abundance of raw materials is complemented by the ease with which the Company's products can be shipped to all parts of the world. Approximately 60% of present production is exported and part of the reason for this is the fact that, although Sarnia is almost 700 miles from Canada's Eastern seaboard, ocean going vessels are able to steam directly from Sarnia, through Lake Erie and Lake Ontario, down the St. Laurence river and out into the Atlantic Ocean. It is not surprising that Canadian synthetic rubber is regularly delivered to over 70 ports throughout the world and that the Polymer Corporation is the largest overseas exporter of synthetic rubber in the world.

Unlike the United States synthetic rubber industry, the Canadian plant was not offered for sale to private industry by the Government after the war. On the contrary, the Polymer Corporation took over the operation of the plant at the end of the war from the group of private companies that had, until then, run it for a management fee. The record gross income value of $75,000,000 during 1957 bears witness to the financial health of the organisation as does the net income, after allowing for tax, of almost $7 million.

Research at Sarnia

Limitations of space preclude any comprehensive description here of the production plant at Sarnia, but the encouragement given to research and development in the Company's laboratories has resulted in its possessing one of the most active and modern research centres in the New World and I feel bound to describe some of the more interesting features of these laboratories, and the recent developments from them that have found application in the production plant.

The Research and Development Division, one of the Corporation's eight divisions, is sub-divided into nine sections. Since its inception, in 1945, the Division has grown steadily until, at the present time, it possesses a staff of well over 200. At the time of my visit, the Polymer Research Laboratory was being enlarged at the cost of $1,250,000 so as to increase its total floor space to 100,000 square feet. And it has recently been announced that a new pilot plant unit is planned to complement the enlarged Research Laboratory. This pilot plant unit is to be concerned mainly with new types of polyolefines, synthesized by the use of stereospecific catalysts. During my visit, I was able to talk with organic chemists carrying out preliminary

Sarnia at night showing Polymer Corp. monomer storage tanks silhouetted against a stormy sky.

experiments with these new types of catalyst and I was specifically invited to be present during one such polymerization in a research laboratory. It is especially pleasing, therefore, to learn now that those early experiments have proved fruitful and that the Corporation feels sufficiently confident to set up this new pilot plant at an estimated cost greater than $500,000. There is no doubt in my mind that this confidence is justified, for these new types of catalyst are opening up a new era in the chemical control of polymer structure.

The Polymer Research Laboratory is built in a pleasing, modern style. It is a two storey building planned in full consultation with the research and engineering staff of the Corporation. The ground floor contains seven laboratories with storage facilities, an engineering machine shop, service workshops, administrative offices and a research conference room, while the first floor contains 17 laboratories, photographic dark rooms, office facilities and a well stocked library. In addition, special " quiet " rooms are set aside for report writing. The building is compact yet roomy and great care has been taken to ensure maximum space utilization. The ventilation facilities have been designed with an eye to work involving inflammable monomers and the system provides a complete change of air throughout the laboratories every five minutes. The laboratory furniture, in line with modern practice, is of unit type allowing maximum versatility—so essential in a research atmosphere.

Rooms have been set aside for special equipment such as the infra-red spectrometer, electron microscope, X-ray diffraction and vapour phase chromatography units. It is very indicative of the times that the Corporation now possesses as many as five vapour chromatography units. These find wide use in many phases of research, especially in the analysis of monomers and hydrocarbon vapours. It is probably true to say that a vapour phase chromatography unit backed by an infra-red spectrometer constitutes one of the most powerful analytical combinations ever possessed by chemists. This combination is being used on an ever increasing scale and is rapidly replacing the more expensive mass-spectrometer. At Sarnia, experience with low boiling hydrocarbons has shown that helium is preferable to nitrogen as a carrier gas in the V.P.C. apparatus.

The Research and Development Division is made up of the following sections:

Compounding and Testing Research Section.
Emulsion Polymer Research Section.
Monomer Research Section.
New Polymer Research Section.
Applications Development Section.
Equipment Development Section.
Pilot Plant Section.
Polymer Development Section.
Technical Service Section.

It is staffed by a team of honours graduates in chemistry, physics, chemical and physical engineering and mathematics. The chemists and physicists are, in the main, employed in the research sections with the engineers in the various development sections. Fresh graduates are introduced to their new surroundings by working under experienced supervisors but they are allowed, at all times, sufficient assistance from trained laboratory technicians and plant operators. The latter are recruited from local secondary and technical schools. It is the regular practice of the Corporation to encourage undergraduate students to work, during their summer vacation, in the laboratories of the Research and Development Division. In this way, the student has a better opportunity of planning his future career with confidence.

The Pilot Plant Section investigates the extension, from laboratory up to pilot scale, of the results of the Polymer Research Section and here can be seen, on a reduced scale, many of the manufacturing and control mechanisms of the production plants. Since the two main production methods, (free radical) emulsion and (ionic) solution, are so different in both chemical mechanism and technique, this Section has been sub-divided into two correspondingly distinct units, one of which concentrates on butadiene polymerization, the other on isobutylene polymerization. Presumably the recently announced new pilot plant for stereospecific catalyzed polymerizations will have much in common with the solution unit of the present pilot plant and will give further opportunity to scientists and technologists, working on different projects, to pool their expert knowledge for mutual benefit.

It is evident that the finance and energy expended by the industry in taking over the plants may be taken as economic proof that synthetic rubber was here to stay, in spite of the free—and indeed increasing—availability of natural rubber. For the first time ever, the rubber processing industry possessed control over a substantial proportion of its basic raw material. It had no longer to accept the uncertainties of the natural rubber supply market or to rely on Government policy for its supply of synthetic rubber. This new degree of economic freedom on the raw material side taken with the expansion of interests into chemicals and plastics on the sales side is a measure of the maturity into which the rubber industry has grown during the last decade.

Simultaneous with plans for the acquisition of the synthetic rubber plants by rubber manufacturers, came plans for the expansion of available research facilities. The plans of yesterday are reality today, and some of these modern research laboratories are located in Akron, the rubber capital of the world. Both Goodyear and Firestone possess excellent, modern research centres in Akron where a whole range of research and development problems have been investigated and solved. The tubeless tyre, new types of high strength synthetic tyre cords, new vulcanization accelerators, anti-oxidants and—perhaps most significant of all—synthetic " natural " rubber have all emerged as triumphs of research.

B.F. Goodrich Research Centre

The most recent of the research laboratories in the district is the impressive Goodrich Research Centre at Brecksville, some 20 miles outside Akron. When this Centre was opened in 1948, the Company was continuing a tradition in research that began in 1895 with the establishment of the first rubber research laboratory in the United States. In those pioneering days, the laboratory was mainly concerned with the analysis and testing of rubber compounds and their ingredients and with the development of new " recipes " which were closely guarded as top secret. Rubber techniques were more of an art than a science. But later years were to bring notable advances such as rubber reinforcement by carbon black, the use of organic vulcanization accelerators, anti-oxidants and, more recently, synthetic rubber and plastics. All of these were attended by increased facilities for basic and applied research. Indeed, Goodrich scientists themselves played a major role in these discoveries and applications, and eventually the many laboratories at the Company's plants were found to be insufficient for the research and development tasks of the future. This necessitated the planning and

construction of a centralized institute where the whole complex of modern research facilities could be gathered together and specialist staff in various fields could work together. After much detailed investigation into existing industrial research laboratories, a completely new type of building was erected at Brecksville, Ohio, to serve as the Company's centre of research.

Perhaps the most striking aspect of the new Research Centre, whose buildings contain 150,000 square feet of floor space, is the complete absence of windows. The main purpose of this is to reduce heat losses in the winter and to ensure efficient air conditioning in the summer. This type of construction allows constant temperature and humidity conditions to be maintained more easily throughout the year, this being very desirable wherever delicate research equipment is in use. Moreover, the assured absence of sunlight is always an advantage where photosensitive materials such as the polyolefine rubbers are concerned. It was not until I had almost finished my inspection inside the Research Centre that I was told that the building had no windows and I must admit that the ventilation and electric lighting was so good that I had not noticed the absence of window space. Perhaps this was because the wall space, where the windows should have been, was so well utilized by shelving, cupboards and apparatus.

In accord with recent general practice, chemists, engineers, mathematicians and physicists worked together as a team on the many problems being tackled here. I was able to see emulsion polymerization experiments being performed on a scale that varied from beer-bottle up to pilot-scale, multi-gallon reactor size. In a remote corner of one large laboratory, a thick concrete shield protected scientists working with a radio-active cobalt source and it was demonstrably clear that there was no shortage of up-to-date apparatus such as spectrometers, an electron microscope, X-ray diffraction equipment and counters for radio-active tracer work. I examined some of the recently developed polyisoprenes and polybutadienes, made with stereospecific catalysts, and spoke to the scientists concerned with the production of Goodrich's synthetic " natural rubber."

The design of the Centre leaves little to be desired. Flexibility is the keynote in small and large laboratory alike. In the Chemical Engineering Laboratory there is ample floor area and ceiling height for all but the most massive type of equipment to be built, while the smaller chemical laboratories contain unit type furniture that can easily be rearranged when required. A special laboratory has been provided for high pressure experiments. Here, special protective devices are available for the staff. Amongst these are one foot thick reinforced concrete barriers and a roof and wall of light construction specially designed to yield in the event of an explosion. Additionally there is a special laboratory, containing particularly efficient ventilation, in which experiments with toxic and inflammable vapours can be more safely performed, and a magnificent library containing well over 10,000 volumes.

In this environment, it is not surprising that the Company has been able to attract so many excellent scientists and technologists and has contributed so much to the science and technology of rubber and plastics.

Synthetic Rubber in Canada

Almost exactly one year after the U.S. Government authorized the American rubber industry to produce synthetic rubber, the Canadian Government set up the Polymer Corporation whose function was to plan the construction of a plant capable of producing 34,000 tons of general-purpose synthetic rubber and 7,000 tons of special-purpose, butyl rubber per annum. At this time, in the spring of 1942, fresh supplies of raw rubber from the Far East were no longer available. Indeed, only two days after the Corporation was instituted, Singapore fell to the Japanese. Just over 18 months later, the Polymer Corporation's plant at Sarnia was producing synthetic rubber on a commercial scale for the first time in the British Commonwealth. Since those early days, annual production has steadily increased until, in 1957, 132,000 tons were produced in all, and the latest information is that production figures for the first three months of 1958 are not appreciably below this rate. When I visited the Corporation's plant and research laboratories, in December, 1957, the plant was in full production and produced a record 11,500 tons during that month and I was all the more able to appreciate the tempo of a synthetic rubber plant working to capacity.

Although the plant does not compare in size with some of the larger of the United States plants, it includes many features that are outstanding if not unique. For example, Polymer produces a whole range of synthetic rubbers of the butadiene-styrene, butadiene-acrylonitrile and butyl types of many different grades in addition to rubber resins and latices. These are produced on a single 200-acre site where the St. Clair river emerges into Lake Huron. This location is ideal in many respects.

Concluding Remarks

To summarize, the present state of affairs in the rubber and plastics industries is one of optimism. The astounding advances of the last ten years stem from the technological progress characteristic of this period of industrial expansion. This has been particularly true of the rubber and plastics scene where Government encouragement, during the war, laid the foundations for the mighty synthetic rubber industry not only by making finance available for capital development but—more important—by supporting almost all of the technical research and development work that was needed in the early days. The industry was never slow to realize the importance of research, and today it is backing this realization by expanding its research facilities.

On the technological side, the industry is having to develop its own staff training schemes so as to augment the technical education of the schools and universities. Indeed, it is in education that America is now beginning to feel uncertain. Although the proportion of university graduates is higher than in Great Britain, there can be no doubt that the standard of graduate requirement is appreciably lower than here. America can no longer afford to wait until the graduate has obtained a doctorate (as he must do, for example, to catch up with his British counterpart) before reaping full benefit from him. But this is a task for the primary and secondary schools rather than the universities, and the present challenge—essentially a federal one—is to lay the foundations of technical education at this early stage. The universities and technology institutes will not be found lacking.

My thanks are due to Mr. E. Newton, of the B.F. Goodrich Research Centre, and to Dr. H. Leverne Williams and Mr. E. B. Storey, of the Polymer Corporation, for their unlimited help and co-operation during my visits. I am particularly indebted to the Trustees of the Bruern Foundation for their Travelling Award and to the Governors of the National College of Rubber Technology for allowing me to take up the Award.

Fig. 3. Extrusion of butyl rubber from production line.

Vacuum Forming and its Applications

By R. W. HARWOOD*

A description of vacuum forming and its uses covering domestic, industrial, packaging and advertising applications

THE vacuum forming process is based on a simple approved principle of suction through a vented mould, which can be produced at a lower cost than those for injection or compression moulding, but this does not mean that shoddy equipment can produce perfectly formed articles, or that the process can be installed successfully by anyone who is a stranger to plastics. It is essential that first-class equipment, which can be quite as expensive in some cases as other plastics machinery, should be installed and a sound knowledge of engineering, other plastics processing and raw materials be used.

Questions arise such as, "What can be vacuum formed?" "Which is the correct thermoplastic sheeting?" "Can the article be produced cheaper and better than by its brother processes of injection, compression or extrusion?"

Omega Plastics Ltd., one of the earliest pioneers of the application of this process, have found the answers to these questions, and the illustrations in this article show that the process does not halt at refrigerator liners and television masks.

Moulds

In the first instance any plastic moulding is as good as its tool, and it has been found essential that metal moulds, generally of light alloy, should be used in all cases. Temperature control of the plastic sheet and mould is important and allowances for shrinkage of mouldings must be made as in other processes. Most moulds are designed to obviate undercuts, although where these are necessary, mechanical or solenoid split moulds can be used, which, of course, are more expensive. All moulds have to be vented with holes to allow the withdrawal of the air between the sheet and the mould.

Methods

Vacuum forming resolves itself into four main methods, straight vacuum or negative forming, drape forming, plug assist forming and air-slip forming; any of these may be combined in any one processing.

In negative forming, which is usually for depths up to 2 in., the plastic sheet is clamped in a frame over the mould so that the sheet and the mould form an air-tight seal. The heater is moved over the sheet for the required time to make the sheet pliable, and then removed. The vacuum is applied immediately from beneath the sheet, and the atmospheric air pressure causes the sheet to form to the shape of the mould. The vacuum is then released and cold air is blown over the surface of the sheet to cool it. Air pressure is applied under the sheet to release it from the mould, after which the clamping frame is released and the moulding removed. The mould itself can be male or female dependent upon where the thinning of the sheet is permissible or upon the use of the finished moulding.

For forming depths from 2 in. upwards, the drape forming method is usually employed, where a male mould is either pushed upwards into the softened sheet or the frame carrying the sheet is moved downwards over the static mould. This movement causes the sheet to stretch more evenly than in the negative forming process.

Plug assist forming takes place in a female mould by stretching the sheet into it with a plug which has a rough conformation to the mould and the final detail is gained by applying the vacuum afterwards. This method is used when a generally flat moulding has one area of relatively deep draw.

Fig. 1. Vacuum formed floor planter which incorporates metal supports.

Air-slip forming (patents applied for by Hydro-Chemie Ltd., of Zurich) is an advance on drape forming in that the male mould acts as a piston in a cylinder and as it is raised into the sheet, hot air trapped beneath the sheet, blows it up thus orienting the sheet in both directions. Vacuum is applied subsequently to form the article, and control of the blowing air is by side vents in the mould, to obviate any excess stretch of the sheet. Advantages claimed are better strength and even thickness distribution in the finished article.

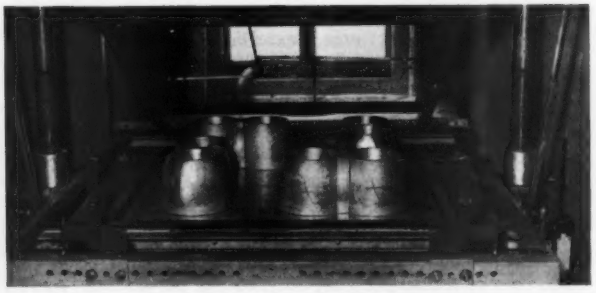
Finishing

Finishing operations are divided into cutting and trimming, punching and stamping, cementing and welding, rolling and edge folding, and decoration.

The excess flash of the sheet around the moulding is removed by guillotine, saw or slicing trimmer, although particular attention must be paid to types of blade dependent upon whether thick or thin gauge sheet has to be cut; generally saws with little or no set are used. Punching and stamping which requires either rule cutting dies or male and female dies may have to be used if a flat flange is required around a difficult contoured article.

For adhering multi-part mouldings, solvents of the particular plastic material are used, although in some cases impact adhesives may

* Director Omega Plastics Ltd.



(Left) Fig. 2. Placing the rod reinforcement on the mould prior to vacuum forming the sheet around it.

(Above) Fig. 3. Four impression alloy mould for the production of planter tops.

(Left) Fig. 4. Removing the formed sheet from the mould.

(Right) Fig. 6. Flash removal from formed p.v.c. insulators by automatic press tool.

have to be employed for dissimilar materials.

Where the edges of the finished product are required to be folded or rolled, as in sliding tops for packaging, heated folding or beading machines are used.

Decoration is attained by mask spraying with appropriate inks, or by preprinting the sheet before moulding with particular regard to register, direction of extrusion of the sheet (if extruded plastics are used), and correct temperature and evacuation rate control. Hot stamping with coloured foil and metal dies can also be used, and vacuum metallizing can be carried out on mouldings as with injection and compression moulding.

Materials

No other manufacturing process has such a wide choice of materials with which to design parts as in vacuum forming.

Because of the many variations in properties, all plastic sheet materials should be checked with suppliers to ascertain the formulation suitable for the purpose. Characteristics such as outdoor weathering, light stability, moisture and dimensional stability, tensile strength, impact and electrical properties, distortion temperature, flame and chemical resistance must be checked.

Most sheeting is produced by casting, extrusion, orientation of extruded sheet, calendering and laminating.

Cast sheeting such as flexible vinyl, acrylic, cellulose acetate, and cellulose acetate butyrate are suitable, and extruded sheets of cellulose acetate, cellulose acetate butyrate, unplasticized p.v.c., styrene copolymer, straight styrene, styrene blend, polythene (both low and high density), acrylic and nylon are becoming available.

Oriented styrene, acrylic, and polyester film with increased tensile and impact strength will soon be marketed, whilst in the calendered and laminated sheeting, flexible vinyl, vinyl copolymer, and p.v.c. are already well established.

The styrenes are the lowest cost group of materials, so they naturally account for the largest percentage of sheet used.

This is because of its low specific gravity (approximately 1.05) which means a larger area of material per lb. than most others, and it is also easily made by the extrusion process.

At the other extreme, cast acrylic and the polyester films are the most expensive, difficult to produce, and to vacuum form.

It will be readily understood that materials often have to be chosen to suit the final characteristics of the product, so that although cost must be allied with this choice, it cannot always be the ruling factor.

Applications

The uses for vacuum forming widen every day as new techniques of forming become known, and new types of thermoplastic sheeting become available.

Fig. 1 shows a floor planter where the top covers are formed on a double impression water-cooled alloy mould, each mould being 18 in. × 6 in. × 6 in. high and the method of drape moulding is used. The sheeting used is 0.060 in. thickness high impact laminated polystyrene. It is of interest to note that the bases, also moulded on a double impression mould, have location points for the insertion by the operator (Fig. 2) of bearer plates, rods and also threads, so that they are moulded integrally by " undercutting " at the same time as the softened sheet is moulded. These enable the legs to be attached by wing nuts, and the resultant assembly is remarkably rigid. This method of inset moulding is now patented.

A range of table flower planters of similar design is being produced for cacti and to take two or three 4 in. pots. Fig. 3 shows the moulds for the Bi-Planters of four impressions and the drape moulding method is used, while Fig. 4 shows a moulded sheet being removed from the machine.

Injection moulded classical head motifs are solvent welded to the sides after moulding and trimming to complete the decoration.

Positive moulding is used in Fig. 5 to mould rigid p.v.c. battery insulators. Fig. 6 shows the flash removal by automatic press tools. The tool is again of light alloy of 98 impressions. It has been found cheaper, in this instance, to produce these insulators by this method than by injection moulding, as a wall thickness of 0.010 in. was called for and the 98 tools were produced to — nil + 0.005 in. limits, and had to be partially machined from original castings. From experiment and experience it is now found that " clean " and extremely accurate castings can be obtained with special alloys, with less and less shrinkage allowance being

(Left) Fig. 5. A moulded sheet of p.v.c. insulators being removed from the 98 impression mould.

(Right) Fig. 7. Formed acetate is used in this razor pack.

required over the original machine-made pattern.

Another interesting use of vacuum forming by Omega Plastics is for the testing of prototypes which are subsequently injection moulded. A wooden pattern is made from the original drawings and by a combination of fabrication and vacuum forming, a sample is made as near identical as possible to the proposed injection moulding. This enables the client to test the design, performance, chemical and mechanical properties of the intended moulding before proceeding with the expensive injection tool.

The value of this use is very obvious and is proving an indispensable addition to Omega's injection moulding department.

In the appliance industries present production parts by vacuum forming are refrigerator door liners, breaker strips, freezer door compartments, drip pans, defroster trays, washing machine lids, clock faces and T.V. masks, all of which can be produced economically and speedily, especially when model variations are contemplated.

The automobile industry are able to use instrument panels, headliners, door panels, rear seat backing (from flexible vinyl), all which are capable of being vacuum formed. Similar types of mouldings can also be used in the aircraft industry.

A large variety of " bubble " and " skin " packs for hardware, cosmetics, food, tools, and industrial accessories can be formed on multi-impression tools or from continuous rolls of raw material. (Fig. 5 shows a typical bubble pack manufactured by Omega Plastics Ltd., as a long run at low cost.) New machine development, now taking place, will shortly increase this company's lead in the packaging field.

In advertising, coloured signs for illumination, and 3D preprinted showcards and displays are extremely effective when vacuum formed, and with counter displays they provide advertisers with forceful lasting media of considerable eye appeal. Delivery time from commencement of design to finished product need be no more than conventional signs and card displays. Large reproductions of packs, jars and products with transferred or preprinted labels are the latest addition to this expanding field.

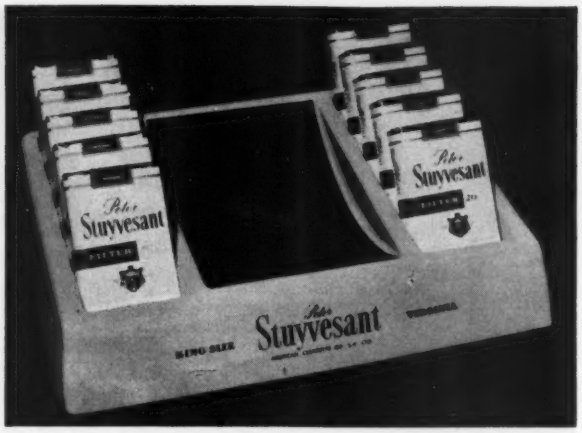


Fig. 8. Counter dispenser/cash unit formed from high impact polystyrene with a p.v.c. lined cash portion. The base is weighted and is fitted with suction pads.

Some raw material manufacturers produce a styrene blend sheet with a wood grain pattern printed beneath the 0.002 in. transparent lamination, which now gives added variety for vacuum formed products over those produced by other plastic processes.

There are many further industrial applications such as tote boxes, conveyor buckets, assembly trays, and insulation parts. The toy trade also view this process as the answer to colourful products manufactured economically, viz. party hats, masks, blackboards, games, inflatable toys, boats and aircraft kits. The design of a vacuum formed toy, however, must take advantage of the thin gauge plastics, using ribs and reinforcing patterns where necessary, and by so doing create a rigid part out of a very thin plastic sheet.

Household items such as drainboards, sinks, bath mats, place mats, picture frames, wall covering and drawer liners are now appearing on the market, and provided the products are not designed to compete against injection moulding but take advantage of the vacuum forming process over other processes, then a further field is opened.

As will be seen from these applications the field for vacuum forming has commenced and will continue to increase in the future. However, it must be remembered that it is not a field to be lightly entered without the proper equipment and knowledge, or failure is certain.

Another facet of the giant industry of the future has emerged from the development stage to take its place alongside the other processes. Each will assist the others to provide buyers with a comprehensive service of plastic mouldings from extremely large to very small sizes, with heavy or light gauge wall thickness according to product requirements, and with a choice of mould costs to suit the length of run.

Glass Fibre Spray Process

A LIGHT, strong plastic boat is one of many products that can be built quickly and inexpensively by a new glass fibre spray process developed in the United States. Almost any surface or forms can be finished in this manner in half the time and at half the cost of conventional glass fibre laminating processes. The plastic finish, which can be made any desired colour, is a special mixture of glass fibre, resin and catalyst. The mixture is chopped, blended and applied by a tool consisting of two spray guns mounted together. Operated by one man, the tool sprays at the rate of 15 lb. per minute, depositing a heavy coat of laminate which hardens within one hour to a hard, durable, lightweight finish. The new process eliminates the work of precutting, preforming, tailoring, fitting and of removing entrapped air. Although the spray mixture contains as much as 40% glass fibre, process costs are low because only one spray coat is necessary and rovings, the least expensive form of the glass, are used to give products markedly improved physical properties. The new process can be used to make bath tubs and sinks, chairs, trays of many kinds.

A boat form that has been sprayed with a special glass fibre laminate is completed when the edges are trimmed. The new process used to make this boat involves applying only one coat of the laminate. Savings in labour and materials total as much as 40% over conventional methods.

A light, strong boat is made speedily by spraying a form with a special mixture of glass fibre, resin and catalyst. Two spray guns mounted together chop, blend and deposit the mixture at the rate of 15 lb. per minute.

World's Industry Employs Plastics

A monthly survey of technical articles published in journals throughout the world.

The original articles from which these abstracts are taken can be seen at the Patent Office Library, 25 Southampton Buildings, Chancery Lane, London, W.C.2. Photostat copies can be obtained from the same source, price 1/6 per page (postage extra). It should be noted that the page number given below the abstract is that of the page on which the artic'e commences.

MATERIALS

Synthetic Adhesives

A SHORT but comprehensive account by Anders on synthetic adhesives and methods for using them in connection with the joining of plastics of various types to other plastics or of plastics to wood or to metal. The account is essentially practical and terminates with a useful table giving the trade names of various types of adhesive, the nature of the resin upon which they are based and such practical details as standing time, curing temperatures, etc.

(*Der Plastverarbeiter*, 1958/Jan./57.)

Polyethylene Film

A SPECIAL report on the use of polyethylene film quotes the consumption in the U.S.A. as being between 180 and 200 million pounds and forecasts double this quantity by 1965. Principal outlet is the packaging field where food and garments show the biggest increase in use.

Included in the report is a survey of the different types of film now on the market with mention of special formulations for different applications.

(*Chem. & Eng. News*, 1958/Feb. 17/83.)

High Temperature Laminates

SCIENTISTS working on the development of high temperature resisting laminates have observed results which reverse the lower temperatures results from chemical flame tests. Using General Electric's new fluid stabilized arch which is capable of reaching 25,000° F. they observed that at 15,000° F. nylon reinforced phenolics showed superior resistance to glass reinforced phenolics. The theory proposed for this phenomenon is the high hydrogen content of the materials. This is supported by the fact that not only glass but high silica glass and asbestos reinforced plastics all erode faster than nylon or orlon reinforced materials.

(*Chem. Eng. News*, 1958/Feb. 24/55.)

Stabilizers for Polyvinylchloride

AN account by E. Bonfiglio on the degradation of p.v.c. in various forms. Reference is made to the effect of iron and other heavy metals on the rate of decomposition, and to the chemical and physical properties demanded of stabilizers, which may be divided into four groups, namely, salts of lead, metallic soaps, organic compounds of tin and organic compounds which the author refers to as auxiliary stabilizers; the effect of the last group appears to be less well defined than that of the metal compounds previously referred to. A list is given of the type and quantity of stabilizer required for p.v.c. in various forms. Although the review is based largely on British and American work it refers also to some Japanese and Russian research.

(*Materie Plastiche*, 1958/April/365.)

Properties of Phenolic, Epoxy and Vinyl Coatings

A COMPARATIVE table gives a ready reference to the physical and other properties of phenolic, epoxy, and vinyl coatings. Figures are not quoted but the properties are classified as excellent, good, fair and poor. Besides the properties, methods of application are given and some typical uses for each of the materials listed.

(*Mats. in Design Eng.*, 1958/April/161.)

TECHNOLOGY

Grinding and Polishing Plastics

BURKART points out that moulded plastic items do not as a rule require grinding and polishing as they are characterized by the possession of a reasonably smooth and very hard highly reflective skin; if this is damaged or removed by grinding then subsequent polishing will not in general restore the initial deep hard "shine." It is frequently necessary, however, to grind away flash and this is usually done on a wheel or a band with an abrasive grain 280–230. Plastic components may also be sawn from plate, filed smooth, and finally polished on the edges of a sanding belt. Edgework of this type can be accomplished in one operation by a recently developed polishing compound. Illustrations are shown of polishing and grinding operations in a shoe factory where plastics parts are being ground and finished in a single stage; mop diameter is 250 mm., speed being 800 r.p.m. Reference is made to a new grinding and polishing compound which does not age on storage and therefore does not tend to give variable results. In regard to polishing by tumbling, it is noted that improvements may be effected by adding to the charge in the tumbler 10–20% of special wooden chips resembling broken match sticks, one end of which is sharpened off to the form of pencil-point. In this way a higher finish is obtained even in small cavities or in sharp corners which cannot as a rule be polished by the addition of balls to the charge. The wooden "chips" last indefinitely and do not need recleaning or repreparing at any time during use. To obtain the best results from a tumbler it is pointed out that the workpiece must be carefully prepared beforehand, excessively rough surfaces and the like being suitably smoothed down. Where metal inserts are present which might cause damage to the work during tumbling, a thermoplastic material is available with which such parts may be covered by dipping prior to tumbling, the covering being readily removed at the completion of the polishing operation. Suggestions are given as to means for prolonging the life of the grinding or polishing balls by means of a special cleaning device which will remove adherent matter, and also to an improved system which will ensure that the drum and its contents be adequately cooled. Finally the development of antistatic polishing compounds are noted together with other compounds which may be readily removed from the surface of the polished articles by any of the normal cleaning solutions—this being a necessary quality when ultrasonic cleaning is employed.

(*Der Plastverarbeiter*, 1958/Jan./17.)

Effects of Radiation on Plastic Packaging Films

A GREAT deal of interest has arisen recently in the possibility of a practical sterilization of packaged foodstuffs by exposure to 1 to 3 Mrep. of radiation. Little information, however, is available in the literature on the effect of radiation at the proper sterilizing level on the properties of thin packaging films.

Results of this work show that film properties are practically unaffected by the proposed sterilization exposure; however, larger exposures can seriously degrade packaging film properties. Polyethylene film is unique in showing property improvement at higher exposure levels.

(*Ind. Eng. Chem.*, 1958/Mar./323.)

Bonding of Teflon

A NEW process is described for rendering Teflon bondable with ordinary adhesives. This process involves the immersion of the polymer in a solution of sodium-naphthalene complex in tetrahydrofuran.

The bath is stable for periods in excess of two months. The surface of the polymer turns greyish brown in colour and the attack, extending to a depth of less than 4×10^4 in., had no significant effect on the electrical properties of the polymer. When the treated surfaces were bonded to metal or to themselves with an epoxy resin, they yielded bond strengths in the range 1,100 to 2,000 lb. per square inch in tension or shear, and bondability was virtually independent of treatment times from 0.5 min. to 24 hours.

The process uses a stable bath and requires no refrigeration or exhaust systems. It is, therefore, particularly suited to small-scale or intermittent operations.

(*Ind. Eng. Chem.*, 1958/Mar./329.)

MACHINERY

Mixer of New Design

AN account is given of a mixer for plastic powders constructed by Soc. Italiana Moritz, Viale Dei Mille 33, Milan. The

apparatus takes the form of a " V," each arm of which is provided with a separate top closure, both arms meeting at a common bottom outlet. It will handle fluid mixes.

(*Materie Plastiche*, 1958/April/328.)

TESTING

Abrasion Resistance

AFTER describing the quick abrasion test for plastics materials in which a specimen is loaded with 2 kg. and worn down on abrasive paper clamped to a drum revolving at 40 r.p.m. for 3 minutes, J. P. Abbat gives a table of properties of plastics which had less than 200 cu. mm. loss of volume after this test.

(*Prod. Eng.*, 1958/Mar. 31/105.)

APPLICATIONS

Reinforced Plastics for Sleeper Compartments

RESIN bonded glass fibre has been used to make the sleeping compartment in an American railway sleeping car. The two shells that form each compartment are screwed together with a melamine strip. After assembly the space is filled with isocyanate foam for sound insulation. The shells are formed by laying up glass fibre mats on plastic moulds and bonding them with polyester resin. The result of using reinforced plastics is a considerable saving in assembly costs as well as maintenance after installation.

(*Prod. Eng.*, 1958/Mar. 31/115.)

Plastics in Chemical Tanks

AN article written by W. Reybold deals with the selection of suitable plastics and the design of chemical tanks. Each type of suitable material is given and a description of its good and bad properties given. On the design side the author comments on the cylindrical, vacuum, and rectangular tanks and their special design features. A brief note is also given on pressure vessels.

(*Chem. Eng.*, 1958/Mar. 24/152.)

Plastics in Cars

A REPORT by Felix Giordano comments on the increasing use of plastics in the American automobile. In 1939 between 2 and 3 lb. of plastics were used, today between 15 and 25 lb. are used and in 1965 it is estimated that between 50 and 60 lb. will be used. Among the applications quoted are moulded glass reinforced phenolic gears in automatic transmissions, window mechanism parts, electrical applications and light lenses. The author foresees new materials formulated specifically for this market and their use in body panels, instrument panels and seats.

(*Prod. Eng.*, 1958/Mar. 24/27.)

Plastics in the Super-Market

A DESCRIPTION by G. Baucia of the first super-market to be opened in Italy, in Milan. The author commences by describing the advantages of the super-market and then goes on to detail the various products on sale with particular reference to the type of packaging employed. Note is made of packaging in polythene film, in " Cellophane," and of the use of polystyrene. The author comments on packaging in " Cryovac." It is noted that some of the " Cellophane "-wrapped items are stored at 0° C. and others at −20° C. Special lines are packed in heat-sealed p.v.c. film. Observations are also made on the use of polyamides.

(*Materie Plastiche*, 1958/April/295.)

Applications Illustrated

A PICTORIAL presentation illustrating amongst other items chairs of modern design in glass-fibre-reinforced polyester resin, a 6,000-litre acid container in rigid p.v.c. and a roofing section in corrugated translucent glass-fibre-reinforced polyester resin. A complete sink unit in melamine and a channel section in glass-fibre-reinforced polyester resin for the chemical industry are also shown.

(*Materie Plastiche*, 1958/April/324.)

Plastic Towers

THIS article follows on a previous article on the use of plastics for tank construction. It therefore does not go into details of the type of plastic best suited for individual requirements but concentrates on the design of the tower. A number of basic rules are given and include uniform thickness of sections, avoidance of sharp angles, avoidance in sudden changes of form and thus preventing moulding strain and the non-use of bosses and pads. Diagrams showing correct and incorrect design illustrate the article.

(*Chem. Eng.*, 1958/April 7/164.)

Plastics for Packaging in the Chemical Industry

ERNST RAMSPECK reviews experience with certain plastics as regards their suitability as packing materials and packaging aids in the chemical industry. Among the polyamides, those on a caprolactam basis exhibit more than all the other polyamides, ability to give a film proof against tearing, highly resistant to chemical attack, and ideal for manufacture of bags and sacks which may be made by blowing. It is readily welded. The polyamides are resistant to practically all solvents, alkalis, weak acids and particularly to oils and fats. Abrasive powder products are most satisfactorily packed in polyamide film sacks, the strength of which is further enhanced by a paper lining. Such sacks may also be used as liners in drums and other vessels. The polyamides are resistant to temperatures up to about 120° C. and sacks made from films of this resin, therefore, may be filled with products still hot from processing—no time need be wasted in cooling off. Laminated films may be made by extruding on to the polyamide film other films of thermo-polastics with lower melting points. Pure polyamide film as well as its laminate with polyethylene may be sterilized. Such a combination is ideal for packing abrasive hydroscopic material for overseas transport or for transport in the tropics. Polyamide/aluminium foil laminates are mechanically very strong and may be heat sealed. Small packets may readily be formed from polyamides either by deep drawing from extruded films or sheet, or produced as bottles and phials by injection moulding or blowing. The ease with which polyamide may be shaped into any desired form and the readiness with which it may be coloured and printed upon are stressed. Cellulose acetate and acetobutyrate also recommend themselves for small packages; they are strong and tough even at low temperatures, retain their form and are weather- and corrosion-proof. Special certain types are resistant to the effect of petroleum and some other organic solvents as well as to weak acids; they are not proof against alkalis, however. Specially to be recommended is their physiological inertness. In connection with the cosmetic trade their high transparency even in thick sections is a valuable property. This is not lost when they are dyed. For special purposes, waterproof grades, and others proof against the transmission of odours may be obtained by using them in conjunction with polyethylene for example. Acrylonitril-butadiene-Styrene mixed polymers of the novodur type made by Farbenfabrik Bayer A.G. are extraordinarily tough and resistant to impact. They may be formed by blowing, injection moulding and deep drawing and are suited for the packaging of mineral, vegetable and animal oils and fats. They are extremely resistant to various alkalis and dilute acids and to petroleum-base solvents. Where damage by breakage is to be avoided they may replace glass, providing that the vessels are not required to be transparent, or in cases, indeed, where transparency is undesirable. The polycarbonates would appear to offer valuable opportunities for small packages in view of their good transparency and high resistance to impact. Plastic foams such as Moltoprene are excellent media for the protection of glass against breakage. They may also function as thermal insulators in conjunction with glass vessels where the contents must be protected against rise in temperature, as, for example, in the case of medical preparations for injection. The unsaturated polyester resins with glass-fibre reinforcements may satisfactorily be used for containers and tanks with capacities of two or more cubic metres. The surface of such material is highly resistant to abrasion. Finally, packages made of metal or non-metallic materials may be given specialized surface protection by means of plastics. Paper packages may be rendered waterproof by impregnation, or where it is desired to prevent the contents adhering to the inner surface of a paper package, interior treatment with siloprene dispersions may be employed.

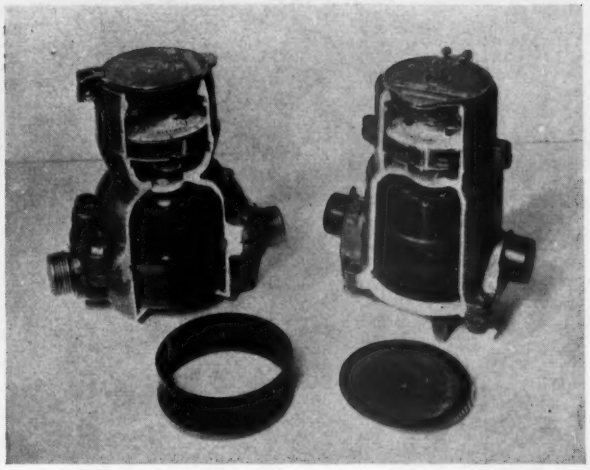
(*Kunststoffe*, 1958/Feb./65.)

Plastics and Electro-technology

DR. ING. CHEM. A. FOULON presents a general review of various types of plastic at present used in electrical engineering. He refers to the p.v.c. emulsions of Chemische Werke Huls AG. which are marketed under the trade names of " Vestolit S70 " and " Vestolit ST70." Reference is also made to Vestyron HI and to RCH polyethylene of Ruhr Chemie AG. The injection moulding resin Luvican MI70 (BASF) is commented upon in relationship to its high temperature resistance and for its resistance to attack by chemicals and by organic solvents. The use of plastics for general building fittings is noted, particularly in the form of castings in the polyester resins. The application and special value of these developments in mining constructions is touched upon.

(*Bergbau Rundschau*, 1957/Sept./506.)

New Productions



(Left) Plastic water filters manufactured by Measurements Ltd. from Styron 475 polystyrene.

(Right) Nylon Aerosol bottle moulded by Cascelloid in Grilon R.50.

New Plastics Water Filter

New plastics water filters have replaced conventional metal mesh in the domestic water meters manufactured by Measurements Ltd. (Dobcross, Oldham, Lancs.).

The filters, which are moulded in Styron 475 polystyrene, are used primarily to remove any foreign matter large enough to cause the rotary mechanism to seize up. They also have to withstand the constant hammering of larger particles which, flowing down the pipeline, impinge on the filter screens with considerable force.

A most important quality is that the filters must not corrode. Until recently these domestic meters employed Monel metal mesh filters which tended to corrode. With particularly aggressive waters it was necessary to use perforated celluloid sheet which imparted a slight taste of camphor to the water.

In this application Styron polystyrene has eliminated the possibility of corrosion and water contamination while easily meeting all the mechanical requirements.

New Plastic Decking

First reports have been received on the performance of a new plastic decking by Semtex. Known as Semdec and approved last year for weatherdeck use by the Ministry of Transport, it has been extensively tested on board ships operating in all climates, including tankers. According to Mr. H. Cadogan, manager of the Semtex Marine Division, it has shown no signs of shrinkage, surface deterioration, loss of adhesion or significant cracking.

Semdec is based on courses of synthetic latex incorporating a lightweight reinforced insulating membrane. Laid at 1¼ in. thickness, its cost is comparable with that of a cheaper timber. There is also an appreciable saving in weight and surface maintenance involves only an occasional surface dressing. It can be bonded to aluminium alloy sub-decks as readily as to steel.

Plastics at the Zoo

A novel and inexpensive method of installing underground telephone cable was used recently at the London Zoo. As with all areas where public interests demand facilities for a reliable communication system, the Zoological Society and the electrical contractors, The Telephone and Electrical Maintenance Co. were faced with the problem of selecting a suitable route for a telephone cable at the Zoo, with the least possible disturbance to the natural surroundings. This was solved by using, as a cable duct, 1½ in. bore polythene tubing produced by the Plastics Division of The Telegraph Construction and Maintenance Co. Ltd. (Telcon.).

No difficulties were encountered in bending or setting the tubing despite a tortuous route which extended for a distance of 300 yds.

A Telcon 10 pair/10 lb. conductor, polythene insulated and sheathed (subscriber type) telephone cable was used and drawn into the tubing and terminated in the appropriate place at both ends.

Laminate Maps and Charts

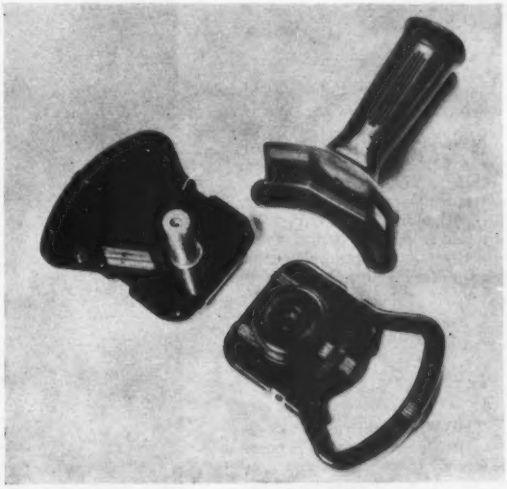
Laminated p.v.c. charts and map sections have been produced by Bribond Ltd., Burgess Hill, Sussex, for use by NATO forces and the Royal Air Force. Further commercial developments of the process now incorporate multi-coloured paper prints, calibration charts for industry, dials and numerous other printing applications.

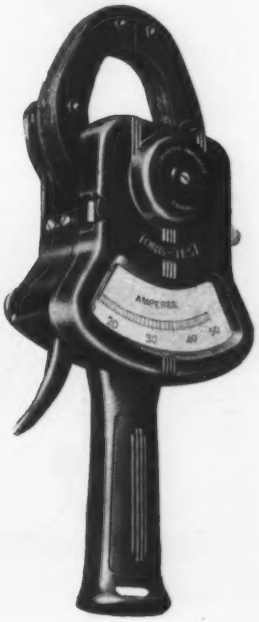
The charts, for radar calibration purposes, had to be printed accurately within .005 of an inch. It is believed that the manufacturing process has not been carried out in this country before.

Construction was of thick clear Astrafoil sheet, thick opaque white Astrafoil sheet, printed with graphs and calibration curves on both sides, and a clear Astrafoil sheet backing. These were bonded together with a special adhesive developed by the company, and which welded all the p.v.c. laminates together but did not cause the printing ink image to distort or bleed.

The R.A.F. contract involved the production of survey maps, sectionalized into eight areas of the United Kingdom and used for navigational aid and the location of airports. In this instance, the existing R.A.F. paper maps were used instead of white opaque printed Astrafoil and the maps were then bonded to thermo-setting laminated plastic for mounting as a pilot's or navigator's knee map guide.

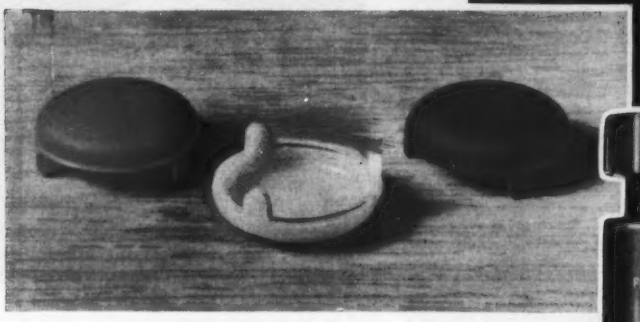
The bonding of the maps and charts was carried out in a steam-heated multi-daylight platen press.



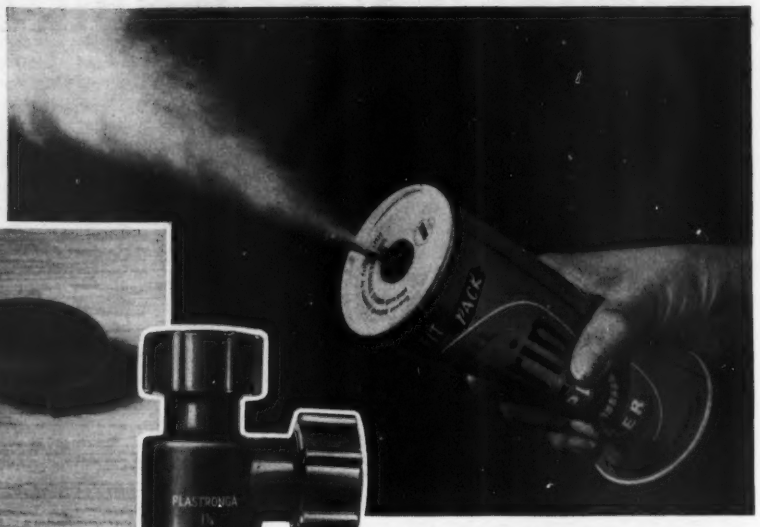


The illustrations show a "Tong-Test" Instrument made by Crompton Parkinson Ltd. and the component mouldings. This instrument is produced in several types and ratings. The mouldings for all are supplied by Birkbys Ltd. in their "ELO" material, providing the advantages of lightness, strength, insulation and good appearance.

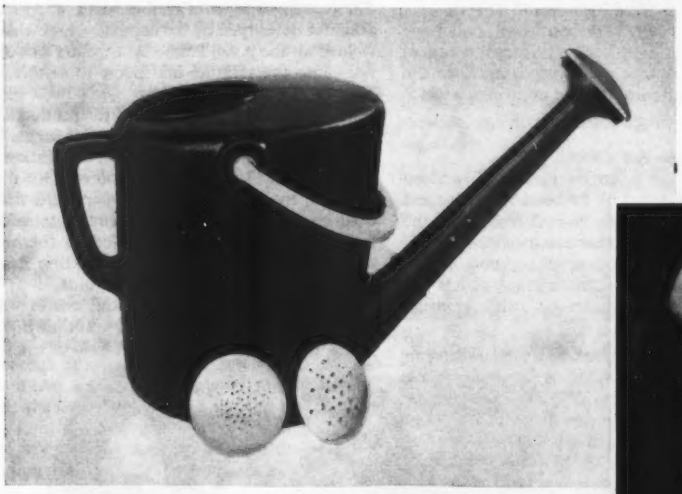
(Below) Injection moulded polystyrene Soap Saver discs moulded by Greenwood Rawlins & Co., Ltd., Brook Road, Arterial Road, Rayleigh, Essex.



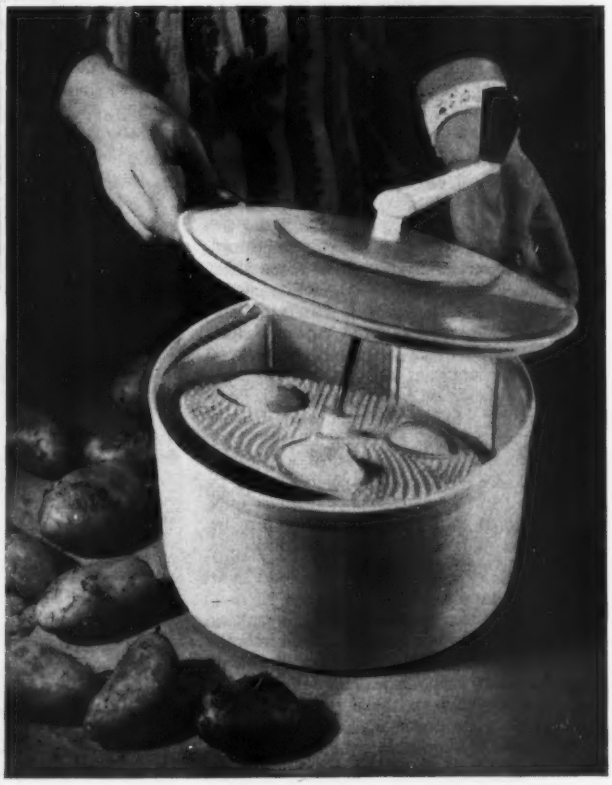
(Right) Designed and manufactured by Yorkshire Imperial Metals Ltd., at their Leeds Works, these recently marketed bottle traps are moulded from Ziegler type polythene. It differs from normal bottle traps in that there is no central tube; instead it is divided down the centre by a tongue, or flap, and the waste passes down one side of this, through the seal and up the other side. The body of the trap is in two parts.



(Above) Shell garden dusts are now available in a new polythene " puffit " pack.

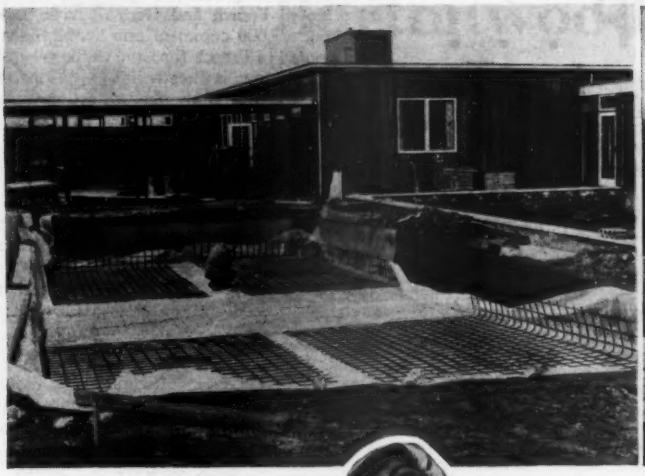


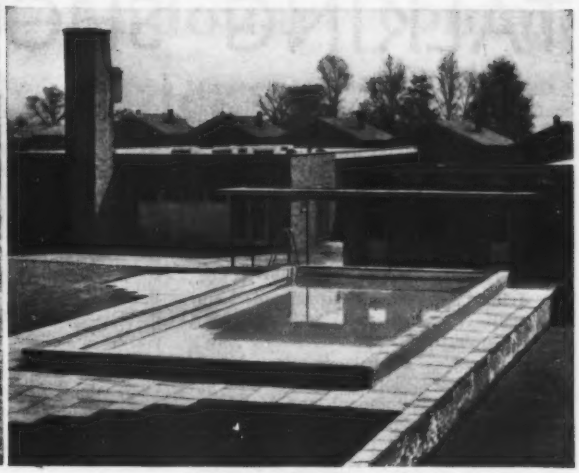
(Below) Potato peeler moulded by Jury Holloware in Alkathene with moulded nylon abrasive plates. Every part is detachable and can be easily cleaned.



(Above) Just introduced in the Bex range of housewares, this conventionally-shaped watering can is made from polythene. Of two-gallon liquid capacity, it has three easily interchangeable sprinklers giving a choice of perforations.

(Left) The Zephyr hair dryer which incorporates a Perspex visor front moulded by General Plastics Ltd., Pattenden Lane, Marden, Tonbridge, Kent.





(Above) Peartree Spring Junior School, Stevenage, has a new permanent swimming pool in the school grounds, at a total cost of only £308. A novel feature which has helped to keep the cost down is the complete lining of the pool beneath the concrete with Visqueen polythene film (left), supplied by British Visqueen Ltd., a subsidiary of I.C.I. No other traditional waterproofing materials were used. The use of the film for this purpose has proved entirely satisfactory. The pool, which was completed in three months, has remained filled throughout the winter without any loss of water.

(Right) A photograph illustrating a new type of p.v.c. sailing wear specifically designed for ladies. This is made with Geon p.v.c. coated fabric (Melloroid) by Quadrant Ltd., 250 Kennington Lane, London, S.E.11.

(Below) The Reliant 5 cwt. van with a capacity of 50 cu. ft. has its body made from glass reinforced plastics.

(Below) The newest use for proofed nylon is for tennis court covers. A cover made up from Dunlop Duotarp material by John Smith (London) Ltd. is being used for the first time this season at leading championships and tournaments. The fabric used consists of a 5½-oz./sq. yd. low twist nylon base cloth proofed with p.v.c.

(Below) Believed to be the first of its kind in Britain, a reinforced plastics garage door has been introduced by Coburn Engineers Ltd., Coburn Works, Peasmarsh, Guildford, Surrey. This new door has many advantages; it is extremely light and manœuvrable; it is rot-proof, and it can be self-coloured during manufacture.

TALKING SHOP . . .

Geigy Bicentenary. Two hundred years of continuous business is an unusual distinction. J. R. Geigy S.A., of Basle, the internationally-famous chemical company, in achieving its bicentenary, decided to celebrate in a manner which reflected its links with so many countries overseas. In London, on May 28, we were invited to a reception the highlight of which was a telephone hook-up between Mr. C. F. Gysin, chairman of Geigy (Holdings) Ltd., Mr. Telford Simpson, chairman of Geigy (Australasia) Pty., Ltd., speaking from Sydney, Dr. V. Sarabhai, chairman of Suhrid Geigy Private Ltd., speaking from Bombay, Mr. L. Collum, of Geigy (South Africa) Pty., Ltd., speaking from Johannesburg, and Mr. M. J. Bunne, of Geigy Chemical Corporation, speaking from New York. The G.P.O. engineers, who achieved the feat of bringing in each call within seconds of the previous message, also linked the meeting in London by direct line with Basle.

The guest of honour was Dr. Armin Daeniker, the Swiss Ambassador, who underlined the difficulties that any Swiss company had to contend with in a country where communications by road and rail are difficult, and where water power is the only abundant resource of nature, all other raw materials having to be brought laboriously in by rail and river.

The company was formed in 1758, in Basle, to sell dyes and pharmaceuticals. By 1833 it was manufacturing its own materials and by 1880 it was an international organization. Today it manufactures leather chemicals, textile dyes, printing dyes, textile chemicals, pigmentary colours, plasticizers, diesters for synthetic lubricants, pesticides, horticultural chemicals, disinfectants, general industrial chemicals, and many other special materials. D.D.T. was discovered by Geigy during the last war, and the synthetic dye Fuchsine was made in 1859, only three years after Perkin's discovery of Mauve.

The Geigy organization has always invested heavily in research, and in this it is helped by the associate companies abroad, numbering some 50 and operating in 17 countries. In Britain, Geigy (Holdings) Ltd., manufactures plasticizers, and first became interested in plastics and rubber 25 years ago in the supply of colours. The plasticizer range includes phosphates, phthalates and, latterly, sebacates.

* * *

Brussels Exhibition and D.C.L. Display. One of the most ambitious projects sponsored by a commercial organization at Brussels must surely be the exhibit of the Distillers group of companies. The stand embraces the whole range of the group's activities, including potables, plastics, biochemicals, etc. And an enormous amount of forethought was obviously necessary to bring together the exhibits and to staff the stand for the six months during which the exhibition is open. Eighty staff members are involved, some 20 of them recruited from the plastics companies in the group. All were put through special language courses to ensure proficiency in French or German, or both. It is delightfully refreshing to hear of an English organization making a determined attempt to man a stand at a continental exhibition with people at least conversant with a local language.

A furnished villa has been rented in Brussels to house the staff, and at least four people are on duty on the stand all the time the exhibition is open, including Sundays. Complete sets of literature in French and German have been prepared. 25,000 copies of one booklet have been printed in French for issue to the general public. The stand is directly linked to London by Telex and a carefully planned system is in operation to ensure that every enquiry receives detailed attention.

In short, D.C.L. have opened a branch office in Brussels for the duration of the exhibition. Although it is largely a prestige affair, the companies may well initiate a great deal of valuable business, and the experience gained by staff members will be immensely useful. I congratulate Distillers in making such a far-sighted decision, and the executives who planned the show so well.

* * *

Initiative in Sales Literature. Without wishing to harp on one subject. I must say that I was most impressed by the latest edition of British Resin Products' general booklet. Comprising 14 pages, it gives a "potted" biography of each of the company's range of products, including a page on Rigidex polythene. The booklet stows away in one's pocket comfortably and has been written with an admirable economy of words.

As an adjunct to the version for distribution in Britain, there is a larger booklet in a four-language edition, English, French, German and Spanish. The languages are sequenced from page to page by a colour code. The bulletins are available from British Resin Products Ltd., Information Department, Devonshire House, Piccadilly, London, W.1.

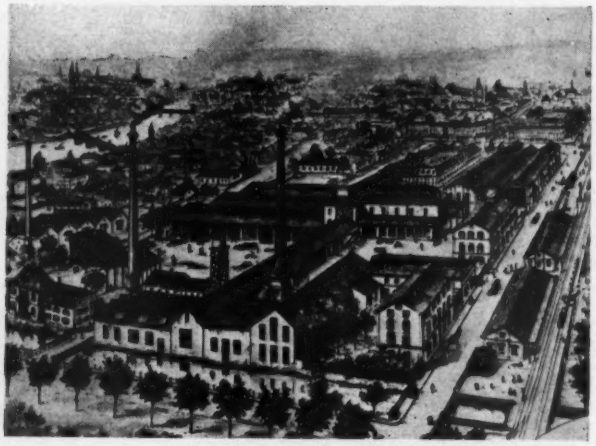
* * *

P.T.F.E. Lubricant. In the issue of the *Financial Times*, dated May 28, a note was published on the use of p.t.f.e. as a solid lubricant for high temperature applications. The technique is to add p.t.f.e. in finely divided form, in the proportion of six parts to one, to metallic powders of metals such as bronze and copper. The mixture is milled, smearing the p.t.f.e. over the metal particles, to yield a mass that is fully efficient for use as a lubricant under high-temperature conditions. Graphite loses its lubricating properties at high temperatures due to the release of water absorbed in it. This partly bound water plays an important part in its lubricating properties at normal temperatures.

PLASTIKON.

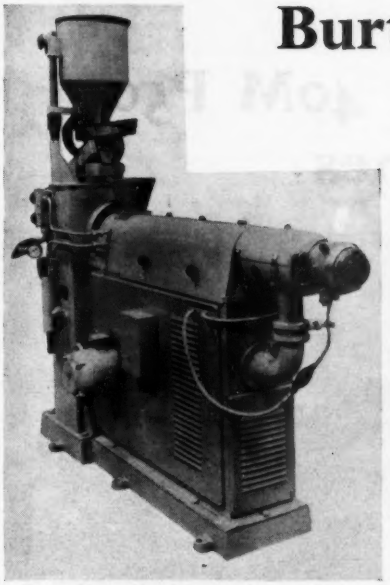
(Above) Manchester works of Geigy (Holdings) Ltd., where plasticizers and pesticides are made.

J. R. Geigy S.A., Schweinerhalle works, Switzerland.



Geigy's extract works in Basle in 1900.

Burtonwood—Andouart 60mm. Extruder



The 60mm. extruder with 20 : 1 L/D ratio screw.

SHOWN for the first time at the Petroleum, Chemical and Engineering Exhibition, a report of which appears on pages 245–247 of this issue, was a new 60 mm. extruder manufactured by Burtonwood Engineering Co., Ltd. Four models of this extruder are available, two of which have 15 : 1 L/D screw ratios and two with 20 : 1 L/D screw ratios.

The body of the extruder is of heavy steel fabricated construction suitably braced to minimize flexing or vibration. The drive is from a 12½ h.p. or 15 h.p. motor dependent on the type of screw and is taken through a Heenan and Froude dynamatic coupling to the reduction gear tray which consists initially of a double helical gear wheel and a pinion and finally of a sprue gear wheel and pinion. All gears are fitted on robust shafts which are supported on bearings of adequate capacity which in turn are mounted in the gear casing of cast iron which forms an integral section of the machine base. An inspection cover is fitted to the top of the gear casing providing easy access to the reduction gears.

Special attention has been given to the thrust bearing which is of the steep-angle taper roller type and is mounted in a separate housing fitted on to the main reduction gear casing. Flood lubrication is provided to all gears and bearings.

Barrel 15 : 1 L/D Model

The barrel on the 15 : 1 L/D model is produced from a solid forging of high grade mild steel which is precision bored and honed. The main barrel is fitted with a hardened and ground nitralloy liner honed to a mirror finish. The barrel is fitted to the water-cooled feed hopper section of the machine by a bayonet coupling and is supported by two slide rails extending to the front of the extruder. This design has been adopted in order to allow the operator to get at the screw with speed and in this way he is able to clean the machine and change the colour with a minimum amount of delay or contaminated material. By undoing the coupling and unlocking the slides the barrel can be pulled forward to the end of the slide rails and then turned at right angles to the machine providing a clear space for either cleaning or removing the screw.

The barrel itself is ranged in three heating zones and each zone is machined to take hairpin type electrical heaters. Deep-seated pockets are drilled in each zone to take the thermocouples. The total heating capacity of the barrel excluding the head is 8.1 kW. The whole is enclosed in a sheet metal protective casing.

Barrel 20 : 1 L/D Model

As the length of screw on this model is longer than the 15 : 1 L/D model the framework of the machine has been extended to provide the necessary support. The barrel itself is similar in all respects to the 15 : 1 barrel, except that because of its additional length it is divided into four heating zones giving a total heater capacity excluding the head of 11.5 kW. This barrel is not attached to the feed section by a bayonet coupling and cannot be withdrawn as described previously. An additional feature which it has, however, is the control air cooling provided by a fan housed in the base of the machine.

Screws

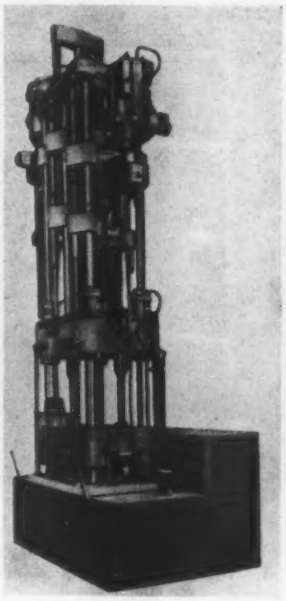
Both the 15 : 1 and 20 : 1 screws are 60 mm. in diameter and manufactured from high tensile nickel chrome steel which has been case hardened, ground and surface finished to the finest limits. The screws are bored for water cooling and fitted with a suitable control valve. Various types of screw are available to give optimum production on different materials.

An adequate capacity feed hopper holds the granular material and discharges it into a vibrationary feed device which gives a control rate of feed to the extruder screw. The actual feed opening is tangential and rectangular in form and has been entirely polished to provide a free flow of material.

Two Colour Injection Machine

THE advent of injection moulded typewriter keys has provided the moulding industry with some difficult problems. We have recently received news of a special machine designed specifically for this type of work. Information at the time of going to press is somewhat limited but we feel that readers will be interested in what little we have available.

The machine is manufactured by A. Triulzi of Milan, who is represented in the U.K. by Alexander Cardew Ltd., 2, 3 and 5 Studio Place, Kinnerton Street, London, S.W.1. Basically it consists of two heating chambers, one corresponding to the standard Triulzi model 300 and the other to the 170V vertical injection moulding machine. These are fitted to a common casting which can be hydraulically raised bringing the injection nozzles clear of the platen for cleaning or for adjusting the heating chambers. Although fitted to a common casting, each heating chamber can be independently adjusted for contact with the mould apertures. The injection rams for each cylinder are provided with individual speed and pressure regulators thus giving a flexible moulding operation. The main movements of the machine are, however, governed by a single regulator and by electric automatic control equipment for time cycles including valve servo-motors, timers and all necessary safety relays. The platen size of the machine is 43¼ in. × 31½ in. and it has an opening stroke of 13¾ in. Mould closing is fitted by means of two main locking rams each of 100 tons force at normal working pressures of 2,130 p.s.i. As the machine has fast cycling platen movement (approximately 1 sec. for the whole 13¾ in. stroke) it is fitted with jack rams suitably cushioned to prevent mould slam. The jack rams operate while the main locking cylinders are automatically filling. A safety relay ensures that if there is any obstruction on the mould the main cylinders will not become pressurized. The two injection cylinders have ample plasticizing capacity for the 5.65 oz. injection of each unit operating on a 30 sec. cycle. The machine is provided with a 13¼ gallons per minute pump and a 66 gallon accumulator to provide sufficient pressure for simultaneous injections. The hydraulic accumulator is particularly essential for machines of this type which operate on high-speed fully-automatic cycles.



Machines for the Industry

The Peco 40M S40 and 40M P50 Injection Machines

NEW developments in thermoplastic materials; the demands of plastic moulders for increased efficiency and economy in operation; and the most exacting requirements for accurate and dimensionally stable mouldings in technical applications, influenced the machine manufacturers to design a new series.

Peco, following their usual practice of making a close study of such requirements, have recently developed a new range of models. Based on their considerable experience, they have introduced a new conception of alternative standard and preplasticizing machines within each capacity grouping.

Illustrating this principle are those designed for moulding within the 12 to 40-oz. (340–1,134 gr.) range, covering the main commercially available thermoplastic materials.

The main design features determining the performance of the machine are: clamping force; platen size; stroke; shot capacity; plasticizing capacity; and rate of injection.

These factors must be selected and combined in such a way that they cover the largest possible number of moulding propositions, whilst the capital and operating costs must be equally attractive.

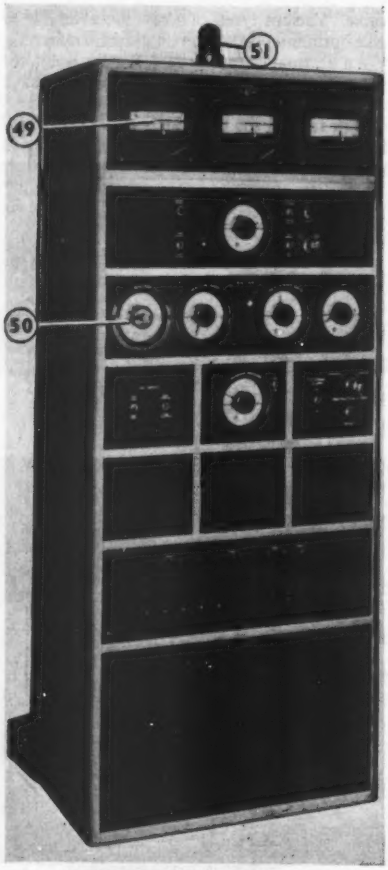


Fig. 1. The electrical control cabinet of the 40M P50.

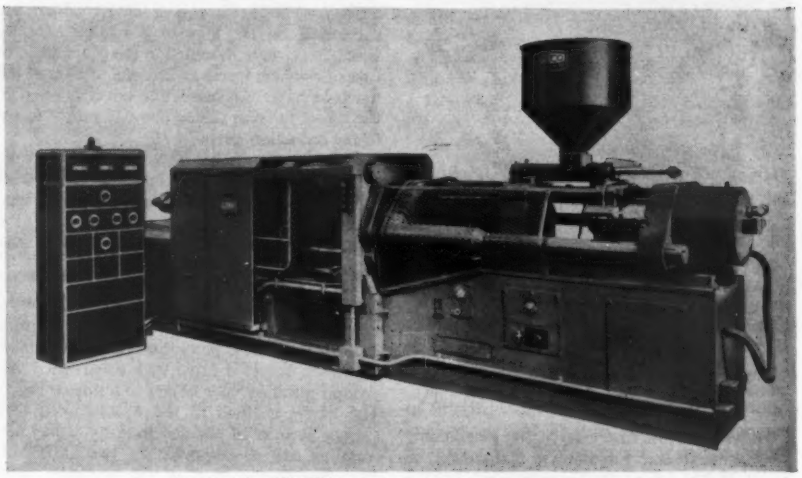


Fig. 2. The 40M P50 preplasticizing injection machine.

The correct and balanced combination for the clamping units for this range was determined viz: clamping force, 300 tons; platen size, 30 in. × 32 in.; mould opening stroke, 17½ in. (adjustable); and this locking unit was laid down as the basis for the two machines:

Type 40M S40. A conventional type of injection unit fitted with a high capacity Thermax plasticizing chamber capable of moulding shots up to 16 ozs. at injection pressures of 19,000 p.s.i.

Type 40M P50. A preplasticizing injection unit fitted with the Peco In-Line preplasticizer. This unit is available as a 24 oz. unit with an injection pressure of 11,000 p.s.i.

It should be noted here that this lower injection pressure is possible for moulding of standard materials through the use of the preplasticizer. An oversize plunger and injection pot capable of moulding up to 40 oz. of polythene at 7,000 p.s.i. can be fitted.

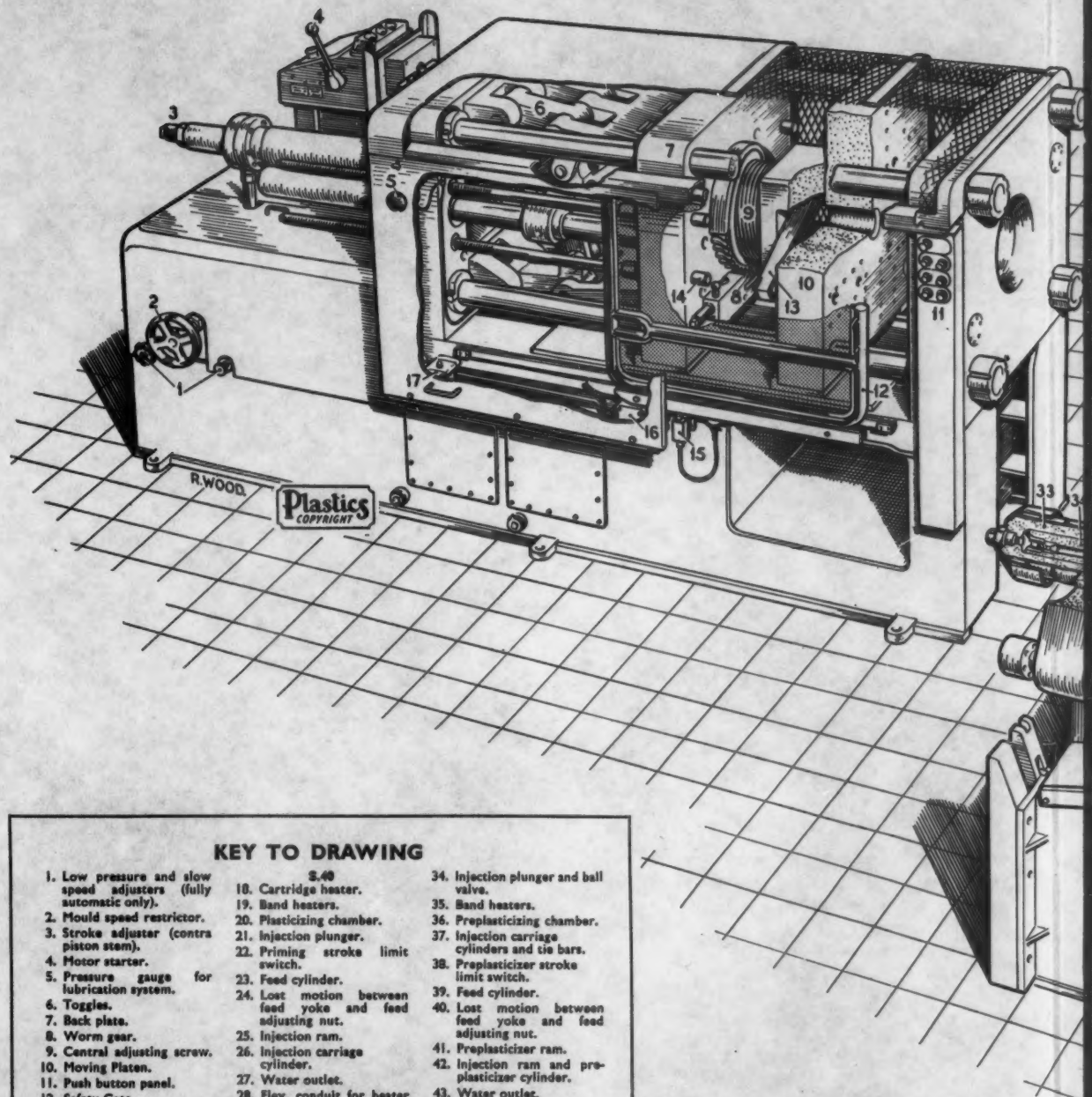
Due to better control of cavity pressures and

SPECIFICATIONS

	40M S40	40M P50
INJECTION		
1. Weight moulded per shot (Polystyrene)	12–16 oz.†	24 oz.
2. Volume moulded per shot (Polystyrene)	20–26.6 in.³†	40 in.³
3. Capacity of feed hopper (Polystyrene)	145 lb.	200 lb.
4. Hopper feed displacement	50 in.³	50 in.³
5. Plasticizing capacity*	110 lb./hr.	150 lb./hr.
6. Preplasticizer pressure	—	10,000 lb./in.²
7. Preplasticizer displacement	—	20 in.³
8. Diameter of injection plunger	3 in.	4 in.
9. Area of injection plunger	7.06 in.²	12.5 in.²
10. Total force on injection plunger	133,000 lb.	137,900 lb.
11. Maximum pressure on material	18,800 lb./in.²	11,000 lb./in.²
12. Full stroke of injection plunger	10 in.	4.75 in.
13. Rate of injection	16.3 in.³/sec.	27 in.³/sec.
MOULD LOCKING		
14. Size of platens h x v	30 in. x 32 in.	
15. Space between tie bars h x v	19 in. x 21 in.	
16. Mould opening stroke (adjustable)	12½ in. to 17½ in.	
17. Maximum mould thickness	18 in.	
18. Minimum mould thickness	8 in.	
19. Mould locking force	300 tons	
20. Projected moulding area*	134 in.²	300 in.²
GENERAL		
21. Minimum dry cycle time	10 sec.	15 sec.
22. Power consumption of heaters at full load	10.5 kW.	17 kW.
23. Motor size	35 h.p.	35 h.p.
24. Capacity of oil reservoir	180 gall.	150 gall.
25. Weight (dry tank)	8 tons	10 tons

* Dependent on material and mould construction. † Single/Double feed.

The Peco 40MS40 and 40MP50 M



KEY TO DRAWING

1. Low pressure and slow speed adjusters (fully automatic only).
2. Mould speed restrictor.
3. Stroke adjuster (contra piston stem).
4. Motor starter.
5. Pressure gauge for lubrication system.
6. Toggles.
7. Back plate.
8. Worm gear.
9. Central adjusting screw.
10. Moving Platen.
11. Push button panel.
12. Safety Gate.
13. Ejector bar.
14. Ejector rod.
15. Gate switch for operator's safety.
16. Gate valve for operator's safety.
17. Gate valve unloading pumps.

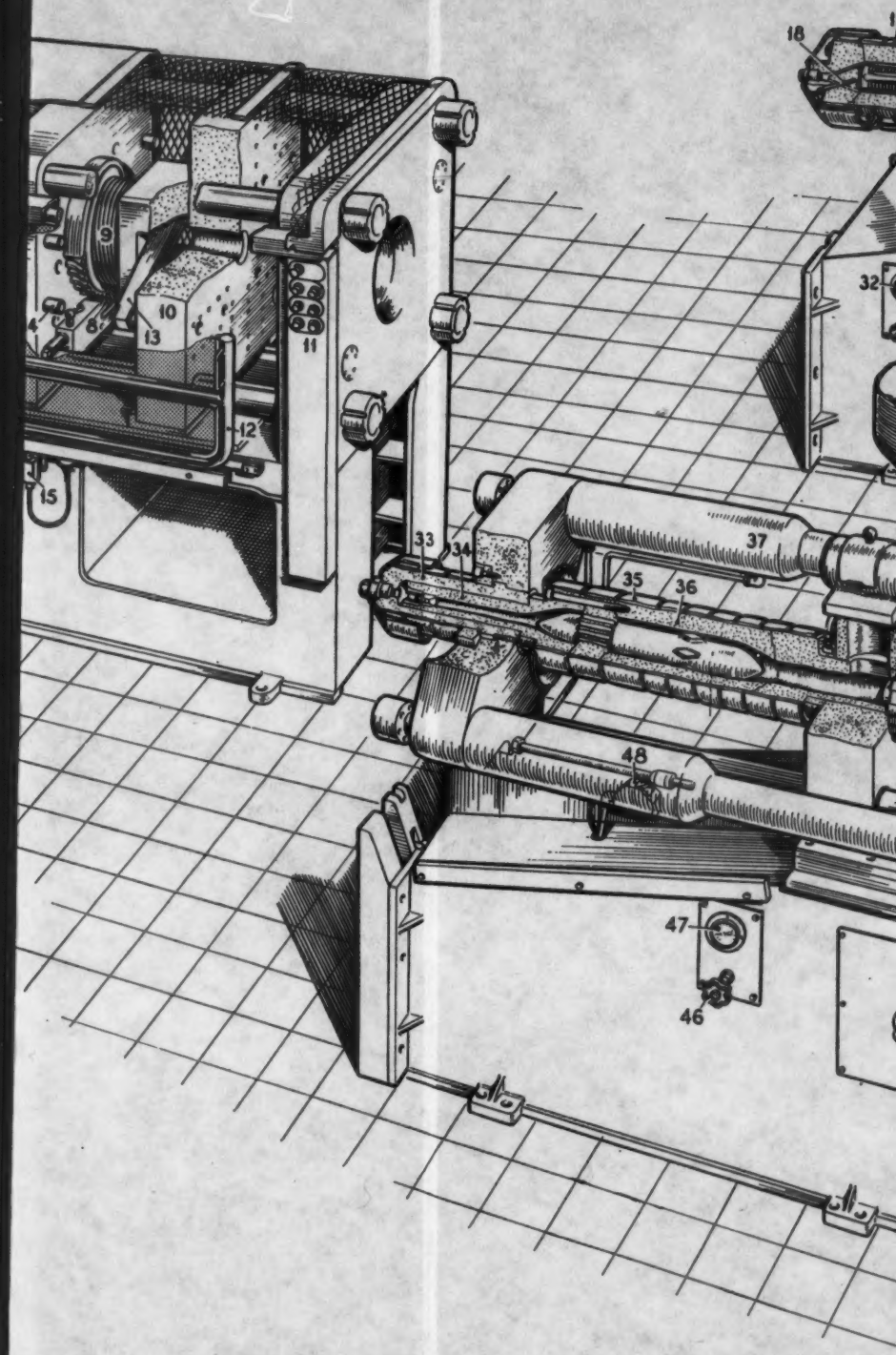
S.40

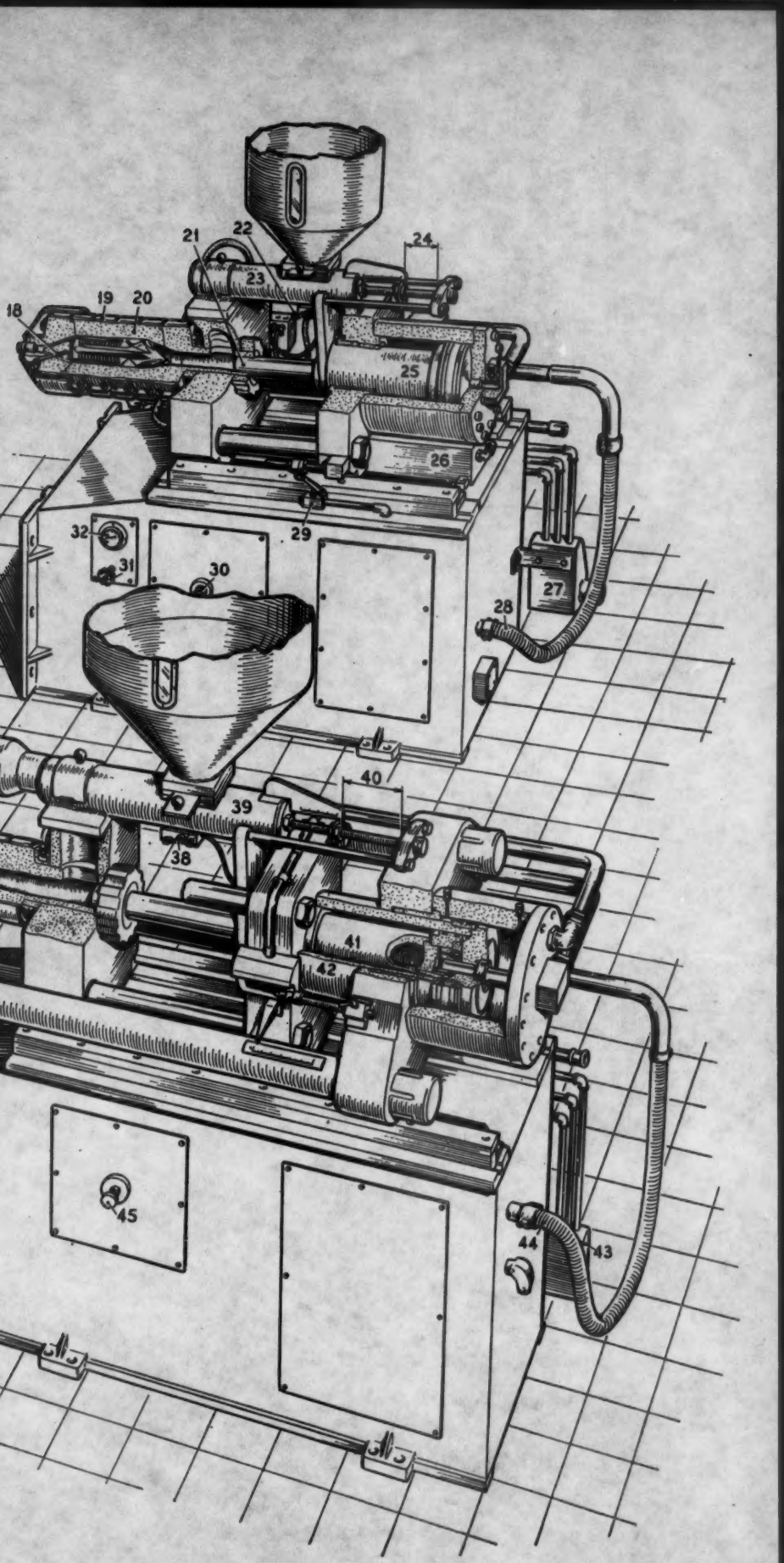
18. Cartridge heater.
19. Band heaters.
20. Plasticizing chamber.
21. Injection plunger.
22. Priming stroke limit switch.
23. Feed cylinder.
24. Lost motion between feed yoke and feed adjusting nut.
25. Injection ram.
26. Injection carriage cylinder.
27. Water outlet.
28. Flex. conduit for heater circuits.
29. Sprue break limit switch.
30. Injection pressure control.
31. Pressure gauge isolator.
32. Injection pressure gauge.

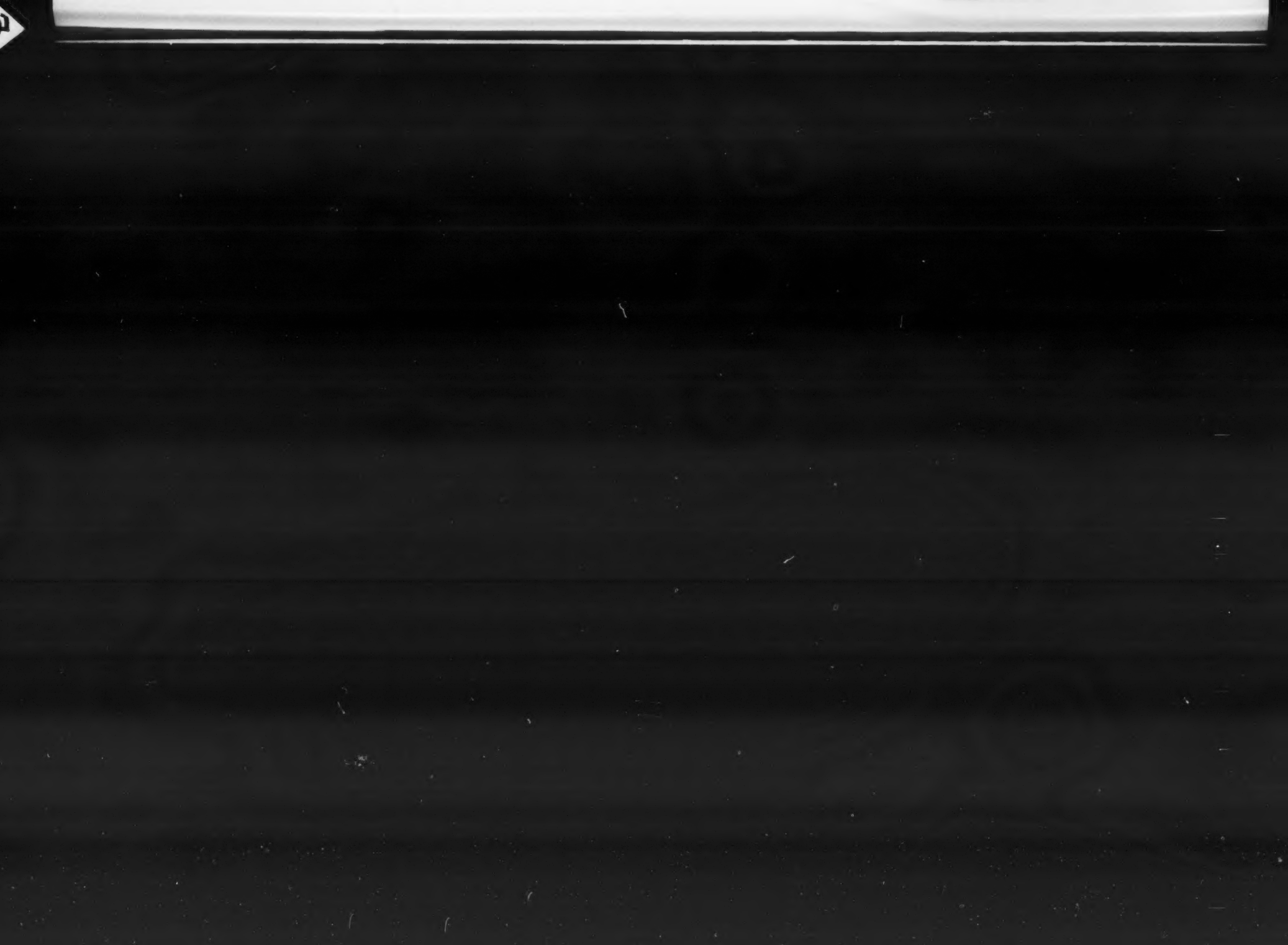
P.50

33. Injection transfer pot.
34. Injection plunger and ball valve.
35. Band heaters.
36. Preplasticizing chamber.
37. Injection carriage cylinders and tie bars.
38. Preplasticizer stroke limit switch.
39. Feed cylinder.
40. Lost motion between feed yoke and feed adjusting nut.
41. Preplasticizer ram.
42. Injection ram and preplasticizer cylinder.
43. Water outlet.
44. Flex. conduit for heater circuits.
45. Injection pressure control.
46. Pressure gauge isolator.
47. Injection pressure gauge.
48. Sprue break and carriage back limit switches.

and 40MP50 Machines




18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
38
39
40
41
42
43
44
45

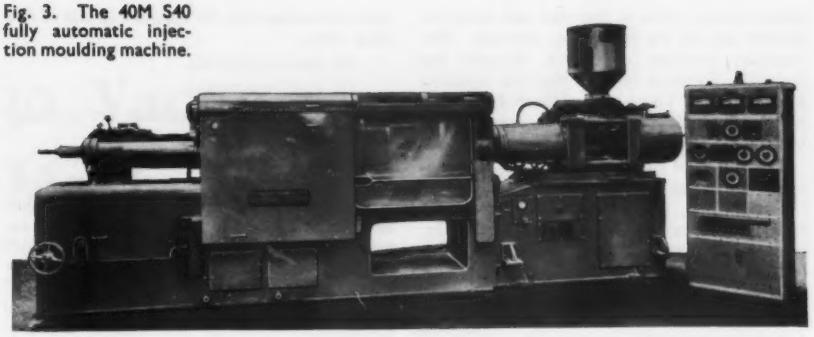


temperatures with the preplasticizer, the same locking unit is capable of holding higher projected areas of the moulding.

Components have been designed as common to either type of machine; it should be noted particularly that the platens are identical, thus ensuring that moulds of a wide shot capacity are within the range of either model.

Examples of complete machines with their control cabinets are illustrated in Figs. 2 and 3. These particular photographs are of machines with certain special features, whereas the perspective drawing is of the standard locking and injection units. Externally, the difference between the two injection units is at once apparent in the greater length of the P50 and in the two long tie bars which unite the injection cylinder and the injection pot.

Fig. 3. The 40M S40 fully automatic injection moulding machine.



THE LOCKING UNIT

The locking force is provided through a conventional toggle system (6) connecting the hydraulic ram to the moving platen back plate (7). By means of a large central adjusting screw (9), conveniently operated through a worm gear (8), the distance between the back plate and the platen itself (10) can be varied to accommodate moulds ranging from 8 in. to 18 in. in thickness. Since this screw transmits the whole thrust, it enables the magnitude of the locking force to be easily adjusted for different moulds. This method is much simpler than that of moving the thrust platen along the tie bars, which involves equal adjustment of the four tie bar nuts.

To save time on the closing and opening of the mould, the stroke is adjustable so that it may be as short as possible consistent with complete ejection. Adjustment is made by means of a " contra piston," which is in effect a false head to the cylinder, with a stem (3) that is screwed through the actual head. It can, therefore, be moved towards or away from the actual head, so that it alters the effective length of the cylinder. It is so designed that the ram piston is cushioned on to it at the end of the opening stroke.

The toggles are lubricated automatically by a hydraulically-operated Tecalemit pump which receives one impulse in each cycle from the pressure line supplying the closing cylinder. The stroke of the pump is adjustable to allow for difference in size of the installation with which it may be used. The lubricators are graded according to the size of the related bearing and each receives a proportionate amount of the total pump delivery.

In accordance with the Company's usual policy, a safety gate (12) is included, which the operator must close before a moulding cycle can commence.

Except when the gate is in the fully closed position, it depresses a hydraulic pilot valve (16) and an electric switch (15), each of which independently prevents the mould from moving in the closing direction. Furthermore, by the pre-selection of a switch on the control cabinet, the electric circuit provides for the mould to be driven to the fully open position whenever the gate is not fully closed.

THE S40 INJECTION UNIT

The injection unit is made up as a retractable carriage for the purpose of sprue break and for convenience of access to the nozzle. It is moved up to or away from the stationary platen by a small hydraulic cylinder (26), situated on the base. The sprue break movement is automatic and its length is determined by a limit switch (29) with adjustable striker.

Alternatively, this function may be isolated by a switch on the control cabinet, and the carriage may then be retracted as far as required by means of a push button.

The Thermax plasticizing chamber (20) used on this machine has improved plasticizing efficiency by more than 50% over the former design. It has a high surface/volume ratio, and heat is applied both to the outer surface by band heaters (19) and to the interior of the spreader by cartridge heaters (18). This arrangement results in a lower temperature gradient between the steel temperature and the mass average temperature of the material, with consequent improvement in control. For purposes of control, the heaters are grouped in three zones, each controlled by an electronic pyrometer, the band heaters constituting two zones and the cartridge heaters one zone.

The feed plunger is coupled to the injection ram with a variable amount of lost motion (24). It therefore advances every time the injection ram advances, but the length of stroke is variable. By means of a rotary switch on the control cabinet, the operator may select " Single Feed " or " Double Feed," either of which may terminate when the injection ram is fully retracted or when it has advanced on to the compacted material. This action takes place entirely during the cure time of the previous moulding; hence, optimum feeding conditions can be realised without loss of cycle time.

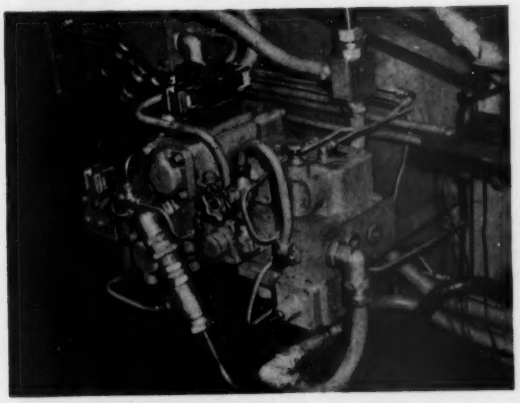
If a change of material or colour is required, the complete chamber can easily be removed from the machine and replaced by a spare unit. The first chamber can then be dismantled and cleaned at leisure. This method is often more economical than purging out the old material in situ.

THE P50 INJECTION UNIT

The principle of a preplasticizer is now well established, but a brief summary of it here may not be out of place.

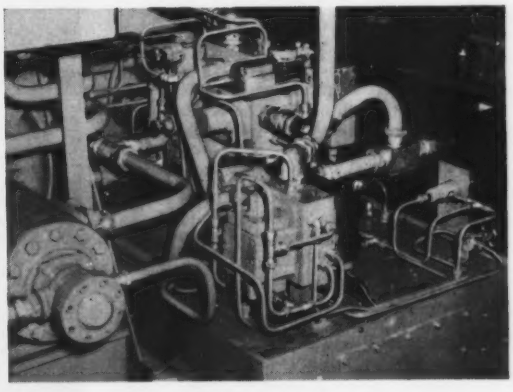
The material is heated in a separate chamber, from which it is forced, in the fully plastic state, into the injection chamber (or transfer pot) (33) during the cure time of the previous moulding. The injection plunger therefore works on fully plasticized material, with consequent avoidance of much of the pressure drop that occurs in a simple injection unit. Hence, it is possible to employ a lower injection pressure, and the projected area of the mould may be correspondingly greater.

In the Peco " in-line " preplasticizer, the heating chamber (36) and the transfer pot (33) are co-axial: the nozzle of the former is designed as the injection plunger (34), and it includes a one-way ball valve to prevent return flow from the transfer pot during the injection stroke: the preplasticizer hydraulic cylinder (42) is used as the injection ram. The complete chamber, the feed cylinder and hopper and the



(Left) Fig. 4. " Gasket mounted " valve assembly on the 40M S40.

(Right) Fig. 5. " Gasket mounted " valve assembly on the 40M P50.



J

injection ram move as one unit and form the greater part of the retractable carriage. The complete carriage, of course, includes the hydraulic injection cylinder and the injection transfer pot. These are connected together by two long tie bars which incorporate the hydraulic cylinders (37) for carriage movement.

The action of the preplasticizer in an automatic cycle is as follows. At the beginning of the cure time, the injection plunger is still forward but not under hydraulic pressure. Pressure is applied to the preplasticizer ram (41), which forces a charge of plasticized material into the transfer pot, and the same action drives the whole preplasticizer back. The ram then retracts, and the process is repeated until the pot, which is maintained at moulding temperature, contains the required amount for the next injection stroke.

Limit switches control this reciprocating action of the preplasticizer plunger and its halt at the pre-determined point.

The feed mechanism is similar to that of the S40, except that it is actuated by the preplasticizer ram and not by the injection ram. The amount of material fed per stroke has no direct bearing on the size of the shot: it merely contributes to the replenishment of the preplasticizing chamber.

The rearward movement of the complete carriage is controlled as in the S40 unit except that, under push button control, it is limited by an additional limit switch adjacent to the sprue break switch (48).

CONTROL

The electrical control cabinet (Fig. 1) is separate from the machine and is generally similar for the two types. However, either type of machine may be supplied in one of two basic forms:

(*a*) Semi-automatic;

(*b*) Fully automatic;

and the details of the cabinet are arranged accordingly.

A semi-automatic machine completes one cycle when the mould close button is pressed.

A fully automatic machine is set in motion by the closing of the Safety Gate, and it recycles automatically. In this case, the cabinet includes a recycling timer and certain other items peculiar to automatic operation.

The external features of the cabinet are the temperature controllers (49) (usually three), a process timer (50) for every part of the operation that requires timing and a number of selector switches. Internally, it contains the electro-magnetic contactors for the heaters and a number of relays for the comprehensive control system. In general, it is designed in sections representing particular control functions. This allows for the omission of sections not applicable to a particular machine and their replacement by blank panels so that a considerable measure of standardization is possible.

For purposes of setting up and testing, the usual complement of push buttons (11) is located on the stationary platen of the machine for the control of individual movements.

With a fully automatic machine, a " mould safety sensing " device is an essential feature. If the mould is closed on an obstruction such as an incompletely ejected moulding, the machine stops, an alarm lamp (51) lights and the heaters are switched off. In order that this device may be sensitive to small obstructions, the hydraulic pressure and the speed of the ram are reduced just before the mould faces meet and are restored immediately after they have met. The point at which the change takes place is determined by separate limit switches, whose strikers are adjustable.

A change of speed on the opening stroke is also available if desired.

Prime Mover and Hydraulic Equipment

A 35 h.p. motor drives two fixed delivery double pumps, each comprising a large and a small section. The large sections and one small section provide a large delivery at low pressure for unresisted movements. For holding on, high pressure is maintained by this small section alone, while the two large sections unload to tank. The other small section provides pilot pressure for the whole system. When the safety gate is fully open, all sections unload to tank.

In the latest examples of these machines, several hydraulic valves are grouped together on a single base-plate, which is bored for the necessary pipe connections. This permits some reduction in the amount of pipework; and the number of such groups, comprising all the valves which can be so mounted, is made as small as possible. The result is a very neat and compact assembly, as will be seen from Figs. 4 and 5.

Manually operated hydraulic controls are provided as necessary. The most generally required are overall mould speed and injection pressure and an injection pressure gauge with isolator: these are brought out to the front on both machines. In addition, on fully automatic machines, two valves are included for setting the required degree of low pressure and slow speed for " mould sensing."

Celluloid Curing Presses

THE celluloid curing presses shown in the illustration are manufactured by Siempelkamp & Co., of Krefeld, Germany. Each of the four-column presses is capable of exerting a total force of 250 tons. The column-type construction was chosen in the interests of stability while this design also ensures reliable ejection of the finished double-block.

The lower ends of the four strong columns terminate in the main cylinder, while the upper ends carry the squeeze plate. The main ram slides in the precision machined cylinder, the platen being attached to the ram by means of a removable socket. This system of securing the platen facilitates rapid replacement of cylinder gaskets.

The platen moves within the steel-frame curing chamber encompassing the four main columns of the press. This curing chamber is lined with special heating panels arranged at right angles to each other. The vertical joints between these panels are provided with a special profile which deflects the plastic material through 2 × 90° and thus offers a very large flow resistance which in effect achieves perfect sealing of the joints.

The platen carries a heating panel of the reliable Siempelkamp design. A checker plate is placed on the heating panel before the first block is charged into the press. After this first block is positioned in the curing chamber, this is covered by another heating panel on which an intermediate grid is placed to receive the second celluloid block. With the press closed, the curing chamber is completely sealed off by a Siempelkamp heating panel fitted to the under side of the squeeze plate.

On completion of the curing process, the chamber is moved downwards by four ejector rams located in the squeeze plate while the main ram and platen remain in the operating position. The two celluloid blocks resting on the platen are thus released and can be removed from the press by sliding them across the two brackets attached to the curing chamber and clearly visible in the illustration.

Three celluloid curing presses manufactured by Siempelkamp.

Machines for the Industry

Daniels 30/30 Vacuum Forming Machine

FOR some while T. H. & J. Daniels Ltd. have been marketing a range of vacuum forming machines under the name "Daniels/Latymer," based on the original design of the Latymer Engineering Co., Ltd.

These machines have done a very good job of work but with the advances that have taken place in vacuum forming techniques, and the ever increasing applications for vacuum formed articles, it was found that greater capacity was required. Accordingly a new "Daniels" machine has been designed and it is intended that it should be the forerunner of a range.

In designing this machine considerable thought has been given to the production of mouldings having deep cavities and it is now possible to produce articles of a complex shape with the minimum of thinning of the material. The photograph shows a small refrigerator moulding, and illustrates the type of work possible. In order to achieve these results attention to mould design and mould temperature control is, of course, also necessary, but if these points are borne in mind all types of formings used at the present time and many more of complex shape can be produced on this machine. Much attention has been paid to the design of the material clamp which is most important when using such materials as p.v.c., where there is a great tendency for the material to be pulled out of the clamp due to the high forming pressures required.

The machine is capable of using a sheet up to 30 in. square and is arranged to produce formings by the straight vacuum forming technique, or drape forming with or without pre-stretching the material by blowing a bubble and also formings incorporating deep cavities and needing a top plug.

The material clamp is of a new type incorporating a parallel link mechanism, and the weight of the frame is counterbalanced by means of an air cushion. The clamp is operated by a bar running across the front of the machine and has compensation for various thicknesses of material. The frame is made of strong section to minimize deflection and does, therefore, ensure adequate clamping force in the centre.

The use of a parallel link mechanism causes the frame to rise vertically and facilitates the removal of deep formings. It is also of great assistance when roll feed is used, enabling the formings to be moved through the machine without fouling the frames.

The heater is 34 in. square and has a capacity of 6.5 kilowatts. It is surrounded by polished aluminium reflectors which ensure an even temperature over the surface of the sheet. Movement of the heater is by means of a quick acting air cylinder.

Instrumentation has received full consideration when designing this machine. Five gauges give instant indication of the main air pressure, vacuum, bubble pressure, drape force and plug force.

Push buttons are provided for single cycle manual operation of the heater, or alternatively it may be controlled automatically for production moulding by means of timing controls built into the electrical circuit.

Adjustment of the heater height is by hand control, using a geared mechanism. The operating handle for this is accessibly placed above the heater.

The machine is screened by fixed guards at the sides and a pivoting guard at the front. The front guard is interlocked with the machine circuit by means of a limit switch so arranged that the operator may have access to the sheet during the cycle for cooling, etc., but no dangerous movements of the machine, such as movement of the drape table or plug cylinder, may take place unless the guard is properly closed.

A vacuum pump with a 1½ h.p. motor is normally provided with the machine. An existing shop air line of 80 p.s.i. is coupled to the machine to provide air for operating the various moving parts and also for bubble blowing, cooling, ejection, etc. Alternatively, a separate air compressor can also be fitted.

All controls are mounted on a sloping panel in front of the operator and comprise several rotary switches and push buttons. The rotary switches enable drape, plug, or bubble forming to be selected as may be required, and a fourth switch enables hand or semi-automatic operation to be selected. The push buttons control movement of the heater, drape table and plug, air injection for bubble blowing, ejection and also the application of vacuum.

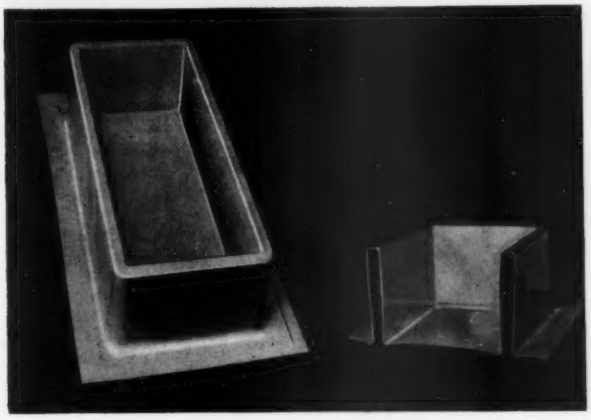
When semi-automatic operation of the machine is selected, the various operations take place automatically, a "sequence" type of control being incorporated by which each movement of the machine initiates the subsequent stage of the moulding cycle. Two timers are provided, one of which determines the time for which the heater remains forward and the other one the time for which vacuum is applied.

Adjustable valves are provided to control the speed of operation of all the moving parts of the machine and these are situated behind a small cover at the front of the machine.

Drape forming is by means of a rising table to which the mould is attached, operated by an air cylinder in the base of the machine. When a straight vacuum forming technique is required, the same air cylinder is used to adjust the height of the mould table.

The plug assist cylinder and the bubble blowing equipment are provided as optional extras, but they are, of course, very useful accessories if the full capabilities of the machine are to be realised.

The operating speed of this machine is considerably faster than earlier models of this size of machine and this materially helps to reduce the overall moulding time. One of the governing factors is, of course, the time taken for the "forming" to cool sufficiently so that it can be removed from the machine and this applies particularly in the case of thick sheets. Here again, careful attention to mould design and temperature controls are important.



Refrigerator liner moulded on the 30/30 vacuum forming machine.

Plastics News

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes and Meetings.

SPECIFICATION FOR HIGH DENSITY POLYTHENE TUBE FOR COLD WATER SERVICES.—A specification has been prepared by a technical committee of the British Plastics Federation to meet the requirement for a sound practical guide in the use of high density polythene in the manufacture of tubing for cold water services.

The composition of the material has been closely defined. The only additives specified are those which have been approved by the Ministry of Food and an additional safeguard is a stress rupture test at 80° C. Smooth, clean extrusion is specified and for the convenience of architects, builders and plumbers tubes are to carry informative, indelible marks at intervals throughout their length.

The British Plastics Federation has been careful to ensure that adequate wall thicknesses have been specified with due regard to the advantageous properties of the material. The conditions given in the hydraulic and tensile tests are such, it is claimed, that users and prospective users can have the highest confidence in high density polythene for cold water services.

Introducing the new specification at a press meeting, Mr. D. Sullivan, chairman of the responsible technical committee of the Federation, said that the new material could be used wherever low density polythene is used, but with thinner wall.

Copies of the specification can be obtained from the British Plastics Federation, 47/48 Piccadilly, London, W.1, price 1/-.

POLYURETHANE FOAM FORMING MACHINE.—One of the recent developments in British industry has been the improvement of foamed plastics and their adaptation to many new uses. To take full advantage of the very great possibilities shown by this type of plastic demands special plant and equipment. This is being made by The Viking Engineering Co., of Hodge Lane, Salford, 5. Their machines, now in continuous production, are in fact the first of British manufacture designed specifically for polyurethane foam.

The photograph shows a Viking V.FP.39 combination machine installed in the premises of Messrs. J. MacAllister King & Co., Ltd., of Rippenden, and some examples of the work done by this type of machine. It is expressly designed for profiling and splitting polyurethane flexible foamed plastic, and will handle blocks of foam up to a total depth of 16 in. and widths of 39 in. (one metre). Messrs. Viking are already constructing machines to handle foams deeper and with wider cross-sections up to 56 in. These, however, are by necessity single-purpose high-production splitters or profilers.

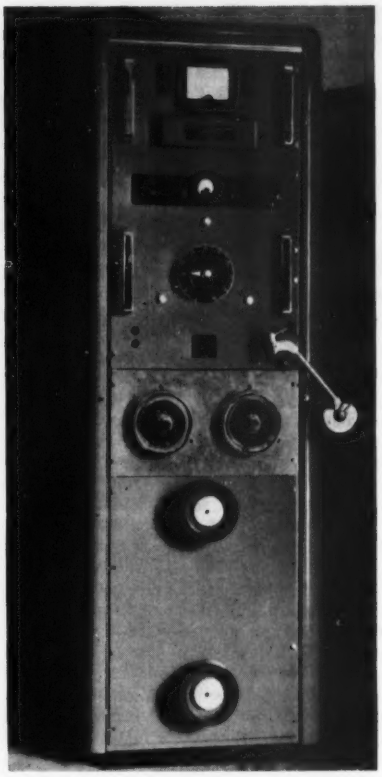
The machine consists of a handknife running in a rigid gib; the drive is reversible, and the conveyor can be raised and lowered electrically. Three sets of profiling rings are supplied; these will produce zig-zag or humped patterns in foam blocks from 1 in. to 8 in. deep.

Viking machine for profiling and splitting polyurethane flexible foamed blocks.

WIRE PREHEATING EQUIPMENT.—The Addison wire preheating installations heat the conductor by passing an electric current through a short portion of it via special contact rollers, equipped with carbon brushes. This method not only ensures the lowest running costs, since all of the energy is used to heat the wire, but also enables the temperature to be controlled accurately and instantaneously.

The equipments are completely self-contained, and they are powered from a single phase mains supply. They are supplied either for Manual Temperature Control, Type 440M, or Automatic Temperature Control, Type 440A.

Both systems comprise similar pulley arrangements, a low and safe voltage being applied between two of the pulleys. This voltage is variable by means of a stepless control, allowing accurate adjustment of the alternating current passed through the wire.



The Addison wire pre-heating equipment.

A special feature is a tachometric circuit which shuts down the voltage immediately the wire speed is reduced below a pre-set minimum. This eliminates the risk of burning out the wire. Another precaution is a relay circuit which ensures that the voltage control is returned to zero before the equipment is put into operation. Other safety features of the control unit provide for automatic power shut down in case of an open circuit in the measuring and power feed circuits.

General

New Compression Joint for Nylon Tubes.—To adequately meet the problem of satisfactorily jointing nylon tubing, Compression Joints Ltd., Tyburn Road, Birmingham, 24, have designed and patented a tube nut type compression fitting, Nitex, which is manufactured from high quality brass.

A very special feature of the design provides for controlled compression which ensures that the tube is not damaged in fitting in any way.

No special tools are required and the joint can be made, broken and remade any number of times without impairing its efficiency. No distortion of the Nitex ferrule occurs. The ferrule incorporates a tube liner which prevents collapse of the tube on compression.

Nitex fittings are equally suitable for use with copper tubes in fractional O.D. sizes when conventional tube nuts and olives would be supplied. A wide range of patterns will shortly be available for the nylon tubes of $\frac{1}{4}$ in. to $\frac{3}{4}$ in. O.D.

Klockner Moeller starter suitable for motors up to 10 h.p.

Reinforced Plastics for Corrosive Liquors.—Following their development of acid and alkali resistant plastics which culminated in the present range of Keebush corrosion resistant plant, the Kestner Evaporator & Engineering Co., Ltd., have carried out an exhaustive research into glass fibre reinforced plastics to provide plant of enhanced mechanical strength.

The new range is presented under the name of Keeglas and a preliminary brochure, Leaflet 300, is available.

Two standard grades of Keeglas are now readily available. Keeglas E and Keeglas F. Both are suitable for working up to 100° C., but the former can withstand a working temperature of 130° C. maximum.

In addition to these two grades alternative grades are available for special duties.

Import Quotas from Japan.—Following the recent conclusion of the Anglo-Japanese Trade Arrangements, Notice to Importers No. 857, dated May 28, gives details of the quotas established for the period ending March 31, 1959, and of the methods of applying for licences.

Provision for small increases in quotas has been made in the case of canned fruit, toys and sports goods, and oleyl cetyl alcohol; the rest of the quotas are repeated at the level for the previous year, with the exception of the quota for transistor radios.

U.S.A. Plastics Industry Team to Visit Russia.—Arrangements have now been completed for a delegation of U.S.A. Plastics manufacturers to visit the U.S.S.R. According to the joint U.S.S.R.–U.S.A. agreement which was signed in January of this year, cultural, technical and educational exchange teams were provided for. The arrangement specifically provided for a team to be composed of plastics manufacturers.

Literature

British Standard for Polystyrene Moulding Materials (B.S.1493: 1958). Four types of polystyrene are specified in this revision of the 1948 edition of the standard in order to cover completely the range of materials now available. (The types are distinguished principally by their different softening points). Apart from this, the principal differences between the new publication and its predecessor are that the colour clause and sieve analysis clause have been deleted, since these matters are normally the subject of agreement between manufacturer and purchaser; in addition, the tests for methanol soluble matter and viscosity have been modified.

The standard specifies requirements for methanol soluble matter, volatile matter, viscosity of 2% solution in toluene and impact strength.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 4/- (postage is charged extra to non-subscribers).

Translations of Reports in Russian Periodicals.—The translation of the following reports is being carried out by the D.S.I.R.: Infra-red studies of isotactic polypropylene (Ref. CTS447); Use of catalysts based on magnesium halogen alkyls and titanium tetrachloride in the production of amorphous and crystalline polymers from olefine and dienes (Ref. CTS448); Ageing of high polymers (Ref. CTS391); On the kinetics of phenol-formaldehyde resin solidification with the aid of hexamethylene tetramine (Ref. CTS413); Conditions for intensifying of styrol polymerization to obtain simultaneously polymers of predetermined properties (Ref. T.C.L.104); Complex formation and chain structure in the polymerization of divinyl by lithium butyl (Ref. CTS477); The correlation of electric and diffusion processes in the phenomenon of adhesion of two polymers (Ref. CTS478); The formation of polymeric hydrocarbons by decon position of aliphatic diazocompounds (Ref. CTS485); The question of utilization of polymeric materials based on p.v.c. for the manufacture of means for individual protection against radioactive radiations (Ref. CTS427); Investigation of the process of hardening of phenol formaldehyde resol resins (Refs. CTS428 and CTS429).

All enquiries for these translations should be made to The Department of Scientific and Industrial Research (C.T.S.), Charles House, 5–11 Regent Street, London, S.W.1.

E.R.A. Publication.—A new publication from the Electrical Research Association Laboratories (Reference A/R 139) deals with the "Inflammability of Silicone, Melamine and Phenolic Resin Bonded Sheets." The report is by W. J. Renwick and is priced 7s. 6d. (postage extra).

Conferences

International Conference on Gearing.—The Institution of Mechanical Engineers is arranging an International Conference on Gearing which will be held in London from September 23 to 25, 1958, inclusive. About 36 papers will be presented and discussed during the various meetings.

Exhibitions

U.S. Packaging Exposition.—High frequency waves are used to seal butyrate plastic blisters or bubbles to paperboard backing in a new machine that is expected to increase the usefulness and life of blister packaging. The machine is manufactured by Erdco Manufacturing Co., Addison, Ill.

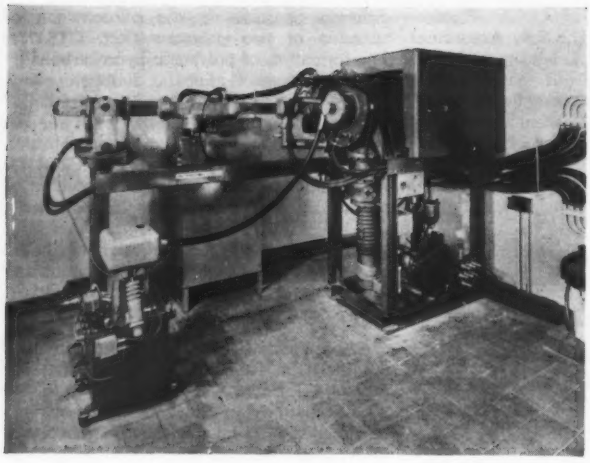
The machine was demonstrated by Eastman Chemical Products, Inc., at the 27th National Packaging Exposition of the American Management Association at the New York Coliseum. The Eastman Kodak Company subsidiary is the supplier of the butyrate plastic from which the film used in the demonstration was extruded.

Also exhibited at the opening of the 27th National Packaging Exposition was a new packaging machine that forms a polythene film bag and wraps it over a dry-cleaned garment in less than five seconds. The machine carries two 3,000-foot rolls of tubular polyethylene film, ½ and 1 mil. thickness, to be used as needed for light or heavy garments. The machine was manufactured by E–Z Packaging Corp., Chicago.

49th Shoe and Leather Fair.—Leading British fashion designers and top British and Italian shoe designers will combine to present a special fashion display of gowns, shoes and accessories at Britain's 49th Shoe and Leather Fair, which is being held at Olympia, London, from September 29 to October 3.

Chicago Plastics Exposition.—For the second time since last December when initial exhibition space drawings were held increasing industry demand has forced The Society of the Plastics Industry, Inc., to increase the total number of exhibit booths available in the 1958 National Plastics Exposition to be held in Chicago

Vacuum forming machine installed by Lec Refrigeration Ltd., for forming inner liners for fitting to their refrigerators.



(Left) The 4-MeV linear accelerator installed in the new Irradiation Laboratory of Metropolitan - Vickers, Barton Works, where it will be used to provide a service for specific investigations.

November 17–21, in the International Amphitheatre.

The number of companies exhibiting in Chicago now totals 187.

Company News

Irradiation Laboratory at Metropolitan-Vickers.—A new Irradiation Laboratory has been opened at the Metropolitan-Vickers Barton Works, some two miles distant from the Company's main works at Trafford Park. Its purpose is to provide an irradiation service available to other firms and organizations interested in the possibilities of electron irradiation as an industrial process.

The new laboratory is a self-contained unit of special construction and interior layout. Its main item of equipment is a 4-MeV linear accelerator designed for irradiation techniques, and provision is made for the efficient handling of a wide variety of products under safe conditions.

A beam-scanner with an output window of pure aluminium foil is fitted to the accelerator. This enables the beam to scan an area of 12 in. × ¾ in. at the window. Greater areas can be covered either by adjusting the position of the scanner, in which case some loss of intensity occurs, or by passing the material through the beam several times, presenting a fresh area to the beam at each pass.

A variable speed conveying system is provided to allow the continuous passage of material through the electron beam, and a work holder giving four degrees of freedom is also provided for handling articles in small number or of irregular shapes.

Short & Mason Ltd. have pleasure in announcing that they have recently signed an agreement with Aktiengesellschaft Chemisches Institut, Dr. A. G. Epprecht, Zurich, whereby they will act as sole agents in Great Britain for the range of Drage instruments.

Bjorksten Research Laboratories.—Dr. Johan Bjorksten has announced the establishment of a Swiss corporation, Bjorksten Basel Operations Ltd., Lautengartenstrasse 12, Basel, Switzerland.

This organization will be devoted principally to market studies pertaining to the common market in central Europe and related problems.

Cyroma Plastics Ltd.—A new company, Cyroma Plastics Ltd., has been formed in association with The General Celluloid Co., Ltd., to take over the manufacturing interests of Cyroma Trading & Investment Co., Ltd., which company, however, will continue to exist but will have nothing to do with the plastics industry.

Two Belgian Cabinet Ministers try on protective helmets at the stand of Malcolm Campbell (Plastics) Ltd., at the Liege Fair. The photograph was taken just prior to the General Elections which accounts for the amusement of the onlookers.

Mr. B. L. Scott joins George Ellison Ltd.

Aero Research Ltd., Duxford, Cambridge, have announced that the name of the Company is to be changed to **CIBA (A.R.L.) Ltd.**

Aero Research was formed in 1934 to pioneer research into aircraft structures, including the development of new adhesives.

The trade names of "Aerolite," "Araldite," "Redux," and other proprietary products are unaffected; the change of name of the company from Aero Research Ltd. to CIBA (A.R.L.) Ltd. takes effect upon June 30, 1958.

F.M.C. Creates New Division.— The Chemicals & Plastics Division is the new name for Food Machinery and Chemical Corporation's Organic Chemical Division.

Ed. Brand Ltd., of 9 St. Cross Street, London, E.C.1, announce that they have reluctantly felt themselves compelled to relinquish their Agency for Battenfeld from July 1. This has been brought about by the fact that Battenfeld have entered the field of extruder manufacture, for which machines Ed. Brand already represent Reifenhauser K.G. On the other hand, Reifenhauser are now collaborating with Eckert & Ziegler on the construction of screw pre-plasticizing injection moulding machines, and, therefore, from the same date Ed. Brand Ltd., will take the British agency for Eckert & Ziegler.

Welding Engineers Ltd., of 1–3 Chantepoulet, Geneva, Switzerland, has been formed to promote the sales of extrusion-compounding equipment in Europe. The equipment is manufactured by Welding Engineers Inc. of Norristown, Penn., U.S.A. The European company is under the management of Mr. P. Sauter.

Personal

Mr. G. R. B. Clarke has resigned as a Director of Vinyl Products Ltd. and Vinatex Ltd. in order to pursue his interests in Phoenix Rubber Co., Ltd.

Mr. S. Smith, chief designer, and **Mr. E. G. Holberry,** works manager of E.M.B. Co., Ltd., West Bromwich, have both been appointed directors of the company.

Mr. B. L. Scott.—George Ellison Ltd. announce the appointment of Mr. B. L. Scott, B.Sc., A.M.I.E.E., as manager of their Newcastle-upon-Tyne Branch Office, in succession to Mr. J. Gibbins, who has retired after 46 years' service with the company.

Automation Equipment

Automatic Finishing for Pen Barrels.—Bristol Repetition Ltd. have applied the power available from Maxam Pneumatic Equipment in the machine shown in the illustration. It is designed to tap, slot, pierce and groove injection-moulded fountain pen barrels.

The barrels are hopper fed into the loading position and an air operated cylinder pushes the barrel into its holder while an override motion operates the clamp for holding the barrel.

The machine indexes and at the second station the barrel is tapped internally. Simultaneously a slotting cutter moves down to the cutting position. The barrel is then indexed to station 3 which is idle.

At station 4 a large cutter mills a thumb groove and simultaneously a cutter enters the barrel, expands at the required position to place a ringed groove inside the barrel and then retracts and withdraws. A piercing tool at the next station squares off the end of the slot nearest to the open end of the barrel. Stations 6 and 7 are cleaning stations at which probes enter the barrel and blasts of air remove swarf while a rubber pad cleans the outside of the barrel. The barrel is then automatically ejected into a chute.

Production has been increased by over 600% by the use of this machine.

Bristol Repetition Ltd., 55/56 Feeder Road, Bristol, 2.

Maxam Air Equipment Ltd., 4 Broad Street Place, London, E.C.4.

Remote Level Controller.—After intensive field research in industry, J. Edward Hall (Elec. Engineers) Ltd. announce the addition to their existing range of level instruments of the new "Proxicon" Mark III dust and weatherproof Industrial Level Controller.

This new capacitance type industrial level controller which is designed to control the levels of any liquids or free-flowing solids without necessitating direct contact with the material, and which has no moving parts in the container, incorporates a number of important advantages, some of which are given here. They include the addition of tapped electrode terminals, whereby remote control can be extended up to 3,000 ft. using V.R.I., M.I.C.C., and other standard types of cable. The incorporation of heavy duty Contactor Type double-pole change-over Relay with Elkonite faced contacts, in place of the Post Office type. The addition of a separate Signal Station Unit, which incorporates the mains voltage signal lamps. Improved circuitary and manufacturing techniques which enables sensitivities greater than 1.0 pf to be achieved under all conditions subject to variations of not more than ± 0.25 pf with mains variations of $+5\%$ to $-7\frac{1}{2}\%$ and not more than ± 1 pf with temperature variation of $\pm 20°$ F. from a 68° F. datum figure.

The new Proxicon Mark III level controller.

J. Edward Hall (Elec. Engineers) Ltd., Clarence Road Works, Leeds, 10.

An automatic machine for tapping, slotting, piercing and grooving moulded pen barrels.

Vacuum Moisture Tester.—The Townson & Mercer vacuum moisture tester is operated as follows. A 5-gm. sample is weighed on a torsion balance, in a vacuum, under a beam of infra-red light, and the loss in weight due to evaporation is measured, and indicated, as a percentage of contained moisture.

The heat comes from an infra-red lamp, with internal reflector, which is contained inside the vacuum chamber, and is adjusted to give a spread of heat evenly over the balance pan. The intensity of the beam can be adjusted from 250 watts maximum downwards.

As the moisture is evaporated, it is removed by the vacuum, and this vacuum has the very great advantage of causing the moisture to be evolved, not only more rapidly, but also at a lower temperature, so that many substances, which tend to decompose under a normal infra-red drier can be safely tested.

As the sample dries, the balance beam moves, and when it finally comes to rest, the pointer can be restored to zero by rotating a graduated dial. The pointer is observed against an index point with great accuracy, and the actual percentage of moisture evolved can be read directly off the scale on the dial. Each division reads to 0.2% and estimation to 0.1% is practicable.

Townson & Mercer Ltd., Croydon, Surrey.

Portable Insulation Flash Tester.—The Gresham Mark III instrument was recently developed and is now in full production on a large scale.

The principle of its operation is quite simple. A voltage between 500V. or 2,500V., as required, is applied to the circuit under test by means of two shockproof probes. If a fault is found a short-circuit is indicated, and the testing voltage is automatically switched off. If necessary the faulty insulation may be burnt out to locate the fault.

It will operate on 200V. 50-cycle supply.

The voltage of the testing output rises in steps of 500V., 750V., 1,000V., 1,500V., 2,000V., 2,500V., A.C., according to the position of the selector switch on the front panel.

The improved quick-acting circuit-breaker is connected to the input circuit and trips at approximately 2.5 amps input current. When it is desired to burn the fault so that, for example, smoke will indicate its position, the "burn-fault" switch will bring into the circuit certain current limiting resistances which will prevent the circuit-breaker from tripping.

Safety is ensured by a thermostat, which opens the circuit-breaker before the limit of the safe operating temperature is reached.

The circuit-breaker switch is white in the Mark III model and pilot neons indicate when the input and output circuits are alive.

The test probes are of polished ebonite with retractable shields so that the live probes cannot be bared until they are actually applied to the circuit under test. They cannot normally be fingered. The probes are connected to the instrument by single-core heavy flex, and the whole tested to 10,000V., and the probe shields have Mycalex tips, which ensures that there is no flash-burning of the ebonite.

Gresham Transformers Ltd., Twickenham Road, Hanworth, Middlesex.

American Report

Fabric Tanks in Oilfields

LIGHTWEIGHT rubberized fabric tanks of 15,000 gallons capacity that are completely collapsible are being adopted in U.S. oilfields to save costs and improve efficiency of operations. The tanks, called " whales " in the oilfields because of their size and shape, are manufactured by The Firestone Tire & Rubber Company at its Magnolia, Arkansas plant. They can be rolled up into a package 8 ft. long by 2½ ft. in diameter and weigh only about one-tenth as much as a steel tank with a comparable capacity.

Because of these features, the whale tanks can be transported easily from one drilling site to another. The average cost of moving the collapsible tank 50 miles in the Rocky Mountain drilling area is $12.50 compared with an average cost of $175 for moving a steel tank of the same capacity this distance.

A small truck can quickly and easily be loaded with seven of the empty " Fabritanks " representing a total capacity of 105,000 gallons. In contrast to this, a large semitrailer is needed to carry one 15,000-gallon steel tank.

The Exploration Drilling Company of Tulsa, Oklahoma, has had excellent results with this tank in operation in the four corners section of the San Juan Basin where New Mexico, Arizona, Utah and Colorado meet. The Firestone Whale tanks have been in use in other operations in this oil-producing area for more than a year.

When filled to capacity the tanks are 47 ft. long, 11 ft. wide and 5 ft. high. They are constructed of two plies of nylon fabric coated with a special neoprene compound designed to protect the tanks against abrasion and the harmful effects of changeable atmospheric conditions. The tanks are D-shaped in cross section when full and are equipped with an internal system of flexible stabilizers which prevent rolling on hilly terrain.

(Right) Unloading the rolled tanks.
(Below) The filled tanks.

Polyvinyl Butyral for Stained Glass

A SIMPLE and economical way to make " stained glass " windows of laminated safety glass has been developed by Monsanto Chemical Company's Plastics Division at Springfields Massachusetts. The new method could replace a conventional manufacturing process more than a thousand years old.

First commercial installation of glass made by the new technique was unveiled recently at the University of New Hampshire at Durham, N.H. There, laminated safety glass seals 240 sq. ft. of abstract painting into a 24-panel window wall in the university's Memorial Union building.

Laminated safety glass can be used to achieve stained glass effect simply and at relatively low cost. Here, working from prototype, John W. Hatch paints on inside surface of glass prior to laminating operation.

John W. Hatch, an associate professor of art at the university, created the abstract design. He completed the painting personally, applying his paints directly to the surface of the glass.

The laminated safety glass then was made by sandwiching three layers of tough plastic sheeting between the painted glass and a sheet of unpainted glass and bonding the five layers with heat and pressure.

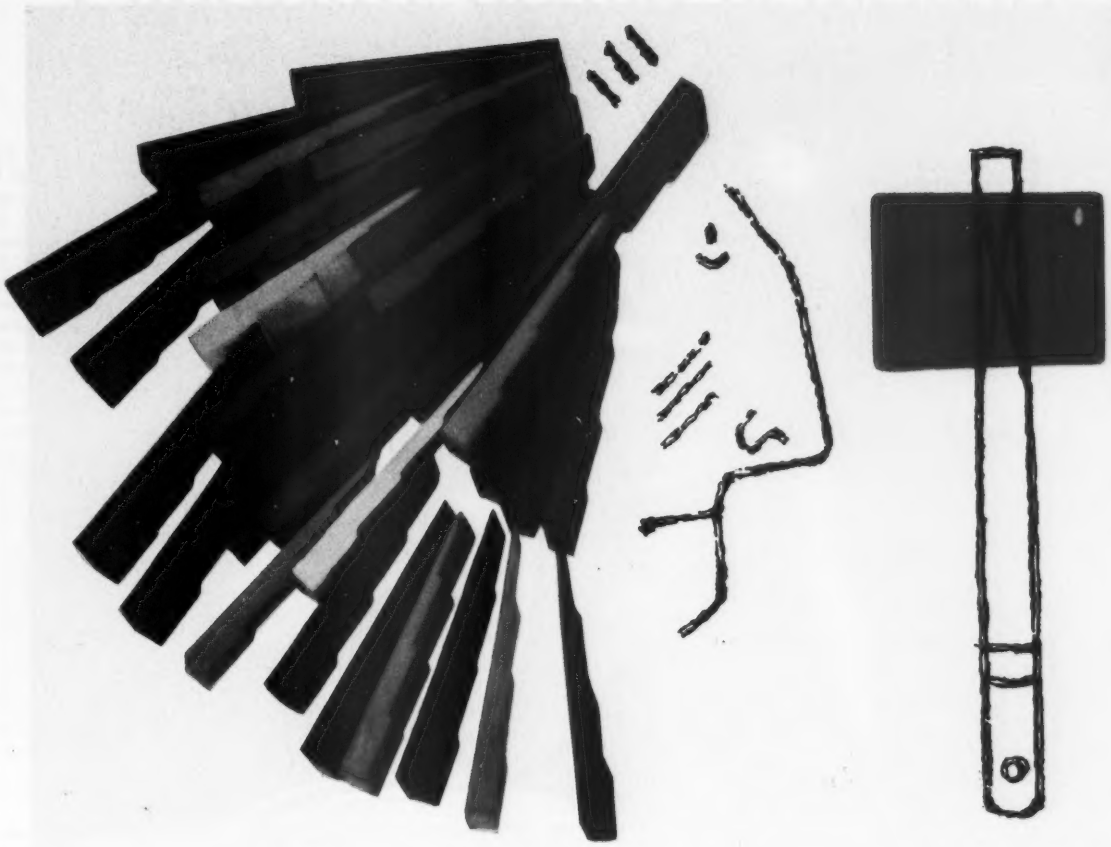
Conventional laminated safety glass has only one plastic interlayer. Two extra thicknesses were added to " cushion " the uneven painted surfaces.

The plastic, polyvinyl butyral, was supplied by Monsanto. It is the same material used in the manufacture of shatterproof laminated safety glass for numerous other applications, including glazing for automobile windshields and side windows.

The technique is said to give artists a new versatility which conventional stained glass cannot. The new technique eliminates the need for cutting, waxing, firing, leading and other steps in conventional processing.

Conventional stained glass is made in a 14-stage operation, whilst laminated safety glass requires only two: painting and laminating.

Painted black lines were used to simulate the leaded effect but large panels may be painted without the use of real or simulated leading.



Courtaulds **CELLULOSE ACETATE MOULDING POWDERS**

extremely tough and durable

not brittle • unlimited colours • no fire risks

clean contours

Courtaulds' Technical Service welcomes your enquiries about any aspects of plastics.

Plastics Division: Little Heath, Coventry. Telephone: Coventry 88031.
22 Hanover Square, London, W.1. Telephone: MAYfair 8000.

Overseas Distributors: Lustre Fibres Limited, P.O. Box 65, Coventry, England.

PA-C

Lustrex—a Monsanto plastic helping industry—to bring a better future closer

Tape recorder spool in Lustrex Hi-Flow 55 by Bettix Ltd.

Lustrex Hi-Flow 55 flows better than any other polystyrene

Lustrex Hi-Flow 55, like all other grades of Monsanto Lustrex, is a HIGH-QUALITY polystyrene. This and its outstanding free-flowing qualities make it the ideal polystyrene for producing top-class mouldings of intricate design, or of relatively thin sections.

* Lustrex Hi-Flow 55 is also very useful for moulding round insets, as it considerably lessens the chances of weld marks.
* Lustrex Hi-Flow 55 is available in a wide range of standard colours; or, special colours can be accurately matched within a few days.
* Advice on how production efficiency can be improved will gladly be given by our technical experts.
* There is a grade of Lustrex for every job in polystyrene.

MONSANTO CHEMICALS LIMITED
Plastics Division, 497 Monsanto House, Victoria Street, London, S.W.1, and at Royal Exchange, Manchester, 2.

In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Ltd., Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Limited, Bombay. Representatives in the world's principal cities.

Monsanto

Lustrex is a Registered Trade Mark. *Regd.*

Capacitative Heating of Dielectrics in H.F. Fields

IF a dielectric is subjected to an H.F. electric field, losses occur in the material which result in the generation of heat. The magnitude of these losses depends upon the physical properties of the dielectric used and in the case of thermoplastics this energy loss due to absorption, can be made high enough to cause the material to soften. This latter fact is utilized, with the additional aid of pressure, for the bonding of synthetic materials. The heating effect can be explained by assuming that the polar molecules comprising the dielectric are jointly polarized under the influence of the applied electric field so that all negative charges are displaced very slightly towards the positive electrode and vice versa. This motion of the dipoles gives rise to frictional heat which forms the basis of the welding process.

A factor in the heating of a dielectric subjected to a high frequency field is the conductivity of the given material. Thus, heating in an electric field involves firstly intermolecular polarization and secondly, conductivity of the dielectric. These variables can be represented as lumped components in a circuit consisting of a capacitor acting in parallel with a resistor, the loss factor being $\varepsilon \tan \delta$ where ε is dielectric constant and δ is loss angle.

In the heat equation $W = \frac{\Delta \text{ T.m.c.}}{dt}$, W is the power in kilocalories per second, ΔT is the temperature difference required to cause softening of the work in the capacitor field (which in the case of synthetic films usually amounts to approximately 140° C.), m is the mass in kilograms of the work in the field, dt is the time difference necessary to attain the softening point (and thus the temperature of 140° C.), and c is a factor for the specific heat, a physical constant. (Constant only in so far as c is constant within normal temperatures, while its value is greater shortly before the softening point.)

Using the equation quoted above it is possible to calculate the power necessary for a perfect weld. Further examination shows that the power given by the equation is essentially lower than the power required in practice for a similar weld. This follows from the fact that energy transformation without losses is not possible in nature. The question thus arises as to the nature of the losses involved in the welding process.

Appreciable losses occur solely through the fact that the sheet to be heated is covered above and below by metallic electrodes. It can be appreciated that the heat tends to be concentrated in the centre of the sheet mass and that the regions near the edges have the effect of heat insulators.

The thermal conductivity number for synthetic materials lies between approximately 0.1 and 1.0 while in the case of metals as used in electrode construction it has a value in the order of 400. For this reason a large part of the energy which should flow into the sheet is lost to the metal surroundings which have far greater heat conductivity. The thinner the sheet the greater the heat loss which occurs as the insulation effect is lower. This is confirmed in practice by a thin sheet being more difficult to weld than a thick sheet although by reason of its smaller mass it should, in theory, as shown in the heat equation, be easier to weld. The curve (Fig. 1) shows that the power consumption per surface unit becomes much greater as the sheet thickness decreases. For instance, it can be seen that the heat losses for a sheet thickness of 0.05 mm. are so great that

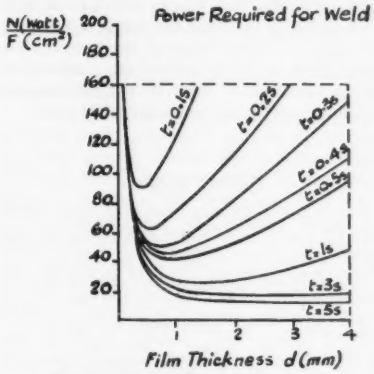


Fig. 1. Showing increased power consumption for thin sheets.

a perfect weld is almost impossible. In terms of magnitude, these pure heat losses now exceed the energy necessary for a weld under ideal conditions.

2. Electrical losses

It is evident that in addition to pure heat losses, electrical losses must also occur. These losses are due to the shunting effect of the electrode capacities. In practice an electrode is commonly fixed to a backing plate which possesses inherent capacity and has the effect of a shunt capacitor with losses.

Special attention must also be paid to the design of the welding electrode. An electrode which consists of a single unit will naturally exhibit a smaller leakage field than an electrode which is built up of several bridges spaced close together. (See Fig. 2.)

Summarizing, it can be stated that the electrical losses referred to above attain a magnitude at least as high as the power necessary for a weld as given by the heat equation and in most cases even higher.

From the foregoing observations it can be seen that the total power necessary for a weld consists of the following components:

1. Power necessary for heating the work.
2. Power necessary to cover heat losses.
3. Power necessary to cover pure electrical losses.

In the majority of cases it is possible by suitable electrode construction to reduce both the heat and electrical losses mentioned above.

In considering electrode design, it follows from the above that the purely electrical losses depend mainly on the pattern of electrode used. A normal bridge electrode without counter electrode will from the nature of its design, exhibit a larger shunting effect owing to its greater leakage field than a similar unit working with counter electrode. An electrode with two bridges set at a distance apart of say 5 mm. will exhibit greater losses than a similar electrode with a greater distance between the bridges. An electrode provided with a cutting edge possesses similar characteristics to an electrode consisting of two bridges in contact with each other. It is thus incorrect to assume that the area to be welded in the case of an electrode with a cutting edge is determined solely by the welding face of the electrode. In this instance it is necessary to include the effect of the space between cutting edge and welding face when considering the dimensions of welding area.

In many instances a sheet of Pertinax* placed between the electrodes results in an extensive improvement to the weld. This result follows for the following reasons:

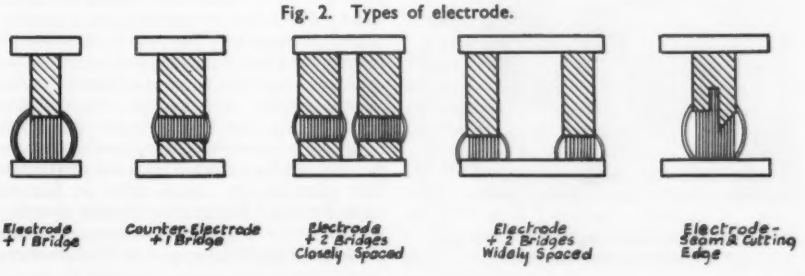
1. Considerable heat is generated in the Pertinax owing to its dipolar characteristics and by suitable positioning of the Pertinax block this heat can be utilized for welding.
2. The Pertinax acts as a good heat insulator against the lower or upper electrode plates.

This indirect method of welding using Pertinax blocks can be extended in many ways. For instance thin sheets of polyethylene which are not normally weldable can be readily welded using this method. In this case, however, the basic principle of dielectric heating, viz., a uniform heating of the work from within outwards, is no longer adhered to as the heat is conducted from the edge regions inwards.

From the foregoing observations it should be evident that with a high frequency generator designed with a given output it is not possible to weld a given surface without taking into account the physical constants of the work, its thickness and the nature and magnitude of the losses appearing. The design of each electrode must be the subject of most careful consideration.

* Pertinax is a phenolic paper laminate material.

Fig. 2. Types of electrode.


Electrode + 1 Bridge
Counter-Electrode + 1 Bridge
Electrode + 2 Bridges Closely Spaced
Electrode + 2 Bridges Widely Spaced
Electrode - Seam & Cutting Edge

The Use of Plastics in the Button Industry

By P. VAUGHAN, A.P.I.

POLYMERIC materials have been used in the button-making industry for a long time. These materials were introduced as alternatives to the raw materials already in use, and have supplemented and in some cases replaced the original raw materials. It is not possible for a summary of this length to include all polymers that may have been tested as potential button-making materials. However, the principal materials are considered, with some reference as to quality, decorative effect and the reason for their selection and continued use.

Button-making is an old-established craft, and natural raw materials were entirely used in the manufacture of buttons until the development of casein at the end of the last century. Bone, horn, leather, wood and pearl-shell were used, and these materials could be cut, milled, polished and finished to give many different and attractive effects. In the last century the very large expansion of the textile trade and advent of mass-production methods for making cheap garments created a strong demand in the button industry for materials which were cheap, uniform and easy to work. In a highly competitive market the cost of raw material was of prime importance, but uniformity of product and good appearance were also very important.

Casein

Any potential new raw material must show definite advantages over materials already in use, and one has in plastics a class of materials which can be modified to be given special and desirable properties. The first synthetic material to be used for button-making was casein. The chemist Spitteler discovered that casein could be hardened with formaldehyde, and this work which was undertaken to find a cheap and indestructible replacement for school writing slates, resulted in Krische and Spitteler taking out their patent in 1899. Casein was taken up by button-making companies, and rapidly gained popularity as " artificial horn." It can be compounded with pigments to produce a wide range of attractive colours, and the finished buttons can also be dip-dyed; thus obviating the need to stock a range of different colours in any particular size or pattern. The water-plasticized dough can be extruded into rods or pressed between heated platens into sheets. As well as plain colours, mottled configurations can be produced by fusing different coloured rods on extruding machinery, or by pressing between hot platens. These effects are in great demand in this industry, and in this way desirable qualities have been introduced in casein to make it a first-class material for button manufacture. Casein can be made with a pearly lustre and large quantities of this type of button have been made in the past and are being made today, in spite of the challenge in this particular field made by the more recent cellulose, acrylic and polyester materials.

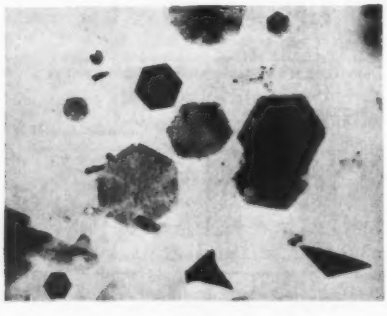


Fig. 1. A microphotograph of a typical synthetic pearlessence.

Cellulose Plastics

The cellulose plastics have also been widely used for buttons. Cellulose nitrate and acetate have been cast in block form for subsequent slicing into sheets of required thickness and turning and finishing. Mottled and pearl effects could be readily obtained, and it was not until recently that other plastics exposed the limitations in transparency, solvent resistance and surface hardness of the cellulose plastics.

Cast phenolic resins were originally made in the U.S.A. between the first and second world wars, and were first made in this country in 1937. For button making, the phenol-formaldehyde condensate is cast in rods which are sliced into button blanks and then processed in the usual way. A wide range of colours and mottled configurations can be obtained in this material. It is inferior to cast acrylic and polyester sheet in transparency and machinability but has very good resistance to oils and solvents.

Pearl Buttons

A large portion of the button industry is engaged in the manufacture of pearl buttons. These buttons are in use in a wide variety of size and design, and are used on practically every kind of garment. Mother-of-pearl shell was at first used, until casein and the other synthetics became available. Shell varies widely in size, quality and thickness, and variation in these qualities complicate the production of good quality buttons, and tend to keep the price of natural pearly buttons high. An added disadvantage of shell pearl is its tendency to chip and flake during working.

First quality pearl buttons are generally considered superior in appearance to any substitute because they have an iridescent sheen which is a unique characteristic. It is possible to imitate the pearl effect only by " external " means. The effect in the shell is the consequence of the way in which it grows and will be considered further later in this article. The disadvantages listed in the previous paragraph result in low conversion to top quality buttons and create a large market for good substitutes. This place is now mainly filled by buttons made from cast acrylic and polyester sheeting. A high lustre and density is now obtained, particularly in polyester, so that the differences between the natural and artificial product is now very small.

Lustre in a pearlescent material is caused by the reflection of incident light at surfaces or interfaces of different refractive index. Pearl shell is formed in thin layers which are built up as the shell grows, and incident light is subjected to a prismatic action which gives the multicolour effect when the shell is viewed in polychromatic light. In the manufacture of synthetic material, the light-reflecting platelets are dispersed in the polymer prior to casting or moulding. These platelets may be crystalline guanine (extracted from fish-scales) or inorganic metal salts of a suitable crystalline shape. Fig. 1 shows a microphotograph of a typical synthetic pearlessence, while Fig. 2 is of crystals of guanine. Another system employs moulding granules of polymers of different refractive indices. The resulting fusion on injection moulding and flow into the mould produces the optical effect of pearlessence. Dispersed pearlescent particles must be orientated in a plane of symmetry in the casting; this being the critical part of the operation and the subject of much patent literature. In general the best effects are obtained in castings where a good quality crystalline substance has been well dispersed in the resin, and gelation or solidification takes place soon after or at the orientation stage. Some form of movement usually provides the orienting force, and practical " know-how " make a great difference to the quality of the product. For example, the velocity gradient induced by passage of the casting syrup into the mould can cause the orientation of the pearlessence parallel to the mould plates, as shown diagrammatically in Fig. 3. Two types of cast sheeting have become of prime importance in pearl button manufacture in recent years, i.e. acrylic and polyester. Several factors have to be considered when assessing the relative merits of these materials. Polyester buttons have excellent heat and chemical stability but are difficult to machine when fully cured, thus presenting manufacturing difficulties but a good and durable type of button. Acrylic sheeting is easier to work, and does not become brittle on storage as does polyester sheeting, but the finished buttons have inferior stability to dry-cleaning solvents and to ironing. It is hoped that standards for heat and chemical

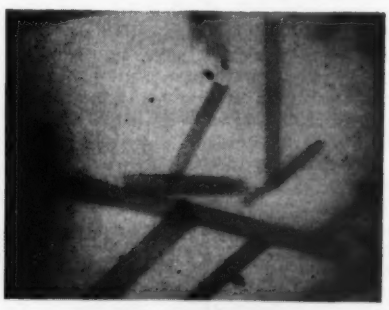


Fig. 2. A microphotograph of crystals of guanine.

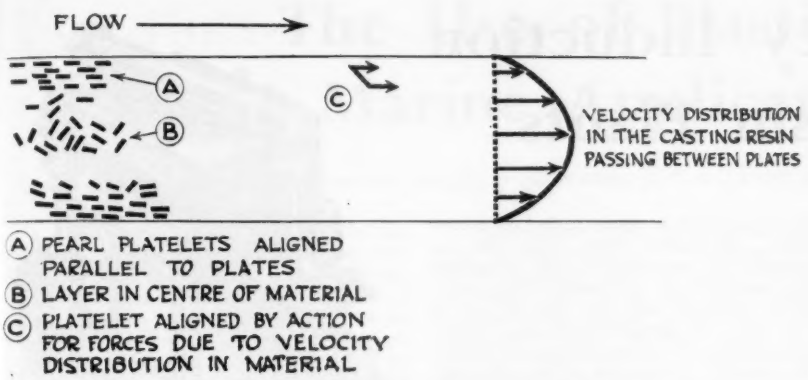

FLOW
A
B
C
VELOCITY DISTRIBUTION IN THE CASTING RESIN PASSING BETWEEN PLATES
A PEARL PLATELETS ALIGNED PARALLEL TO PLATES
B LAYER IN CENTRE OF MATERIAL
C PLATELET ALIGNED BY ACTION FOR FORCES DUE TO VELOCITY DISTRIBUTION IN MATERIAL

Fig. 3. A diagram showing how orientation of the pearlessence can occur in moulding.

stability will be established in this country, so that minimum standards for these qualities will be upheld in the industry. A recent trend has been to improve the resistance of the acrylic types by introduction of a co-polymer which will induce a degree of cross-linking in the finished polymer. This material is harder to work than polymethyl methacrylate sheeting, but in this way it is possible to achieve a compromise between one material and the other. Another factor which influences this balance is the reclaim value of the off-cuts and residues from blank-cutting of acrylic sheets, which can be depolymerized to be used again in sheet manufacture. This is not the case with polyester, where off-cuts have no reclaim value.

Recent developments in the U.S.A. have been in the moulding of buttons direct from polyester syrups. Resins of very high viscosity are used, and the process conditions are closely guarded secrets of the companies engaged in their manufacture. At present results are inferior to those obtained from cast sheets, but the obvious advantages of directly moulded buttons will doubtless induce further developments along these lines.

We have discussed pearl buttons, which are a high-prices type of button allowing a wider price margin for manufacturing costs than is the case for plain coloured buttons. This type is most economically produced in a minimum of separate stages. For this purpose a moulding technique is most suitable, and most of the thermoplastics have been injection or compression moulded. Thermosetting polymers, for example urea-formaldehyde moulding powders, have also been moulded on a large scale and the resulting buttons have excellent stability. In particular polystyrene has been very widely used. It can be injection moulded using quick operation cycles, and can be made in pearl effects and in a range of transparent and translucent light-stable colours.

P.v.c. Buttons

In many cases the special properties that plastics possess can be utilised to advantage. Moulded p.v.c. buttons have been made for attachment to p.v.c. garments which are seamed by H.F. welding. The buttons are injection-moulded with a thin laminar flange of p.v.c. attached to the shank of the button which can be H.F. welded to the garment. This method of attachment is superior to the press-stud method normally used, and does not necessitate puncturing or crimping of the p.v.c. sheet, which has a relatively low tear-strength.

In conclusion, attention is drawn to the way in which man-made polymers are replacing natural raw materials by virtue of their adaptability to conditions which are desirable both in the manufacture and in the finished product in the button industry.

Unpublished Reports

ENQUIRIES for the borrowing or for obtaining photocopies of these reports should be made to The Department of Scientific and Industrial Research, Lending Library Unit, 20 Chester Terrace, Regent's Park, London, N.W.1.

Investigation of the Preparation of Acrylon Rubber Modifications utilizing Copolymer and Terpolymer Systems. (PB 121441.) In order to improve acrylate-acrylonitrile rubber formulations which exhibit good heat stability and fuel resistance, modifications of this system were investigated using trifluoroethyl acrylate as the major component.

Performance of Glass-fabric Sandwich and Honeycomb Cores at Elevated Temperatures. (PB 121697.) This report presents the results of flatwise compression and flexure tests of heat-resistant glass-fabric honeycomb cores and sandwich after short and long periods of exposure to temperatures from 75° to 700° F.

Performance of Sandwich with Cores of Foamed Silicone and Modified Polyester Resins at Elevated Temperatures and at High Humidity. (PB 121707.) Compression, tension, and shear properties of plastic sandwich foamed-in-place cores were determined at temperatures from 75° to 700° F.

Annual Report on Research for use in ANC-17 Bulletin "Plastics for Aircraft." (PB 121695.) This annual report by the U.S. Forest Products Laboratory covers developments in the programme of research in plastics for aircraft conducted by the laboratory during fiscal year 1956. The data in this report are related principally to glass-reinforced plastics.

Dynamic Properties of Plastics and Rubber-like Materials. Final Report. (PB 123713.) A comparison is presented between the method which has been used for the computation of the experimental data at Illinois Institute of Technology and a previous method which was developed at Cambridge (England) for the computation of experimental data on plastics and rubber-like materials.

Development of Sizings for Glass Fabric in Polyester-Resin Laminates. (PB 107770s2.) Various functional organo-silicon derivatives were investigated as glass fabric sizing for improving glass fibre laminates made with melamine, phenolic, silicone and epoxide resins.

Plastic Materials for Vision Devices. (PB 121028 and 121027.) The objective of this project has been to investigate the potentialities of producing a plastic periscope with a resistance to abrasion approaching that of glass.

Fundamental Studies on the Adhesion of Organic Materials to Metal Substrates. (PB 121982.) Model systems have been prepared in order to study the phenomenon of adhesion. This report is in four sections.

Development of Metal-Bonding Adhesive with Improved Heat Resistance. (PB 121856.) Studies were conducted on an experimental phenolepoxy resin tape adhesive.

Polymer Evaluation Handbook. (PB 121870.) The Polymer Evaluation Handbook provides a system for obtaining a maximum amount of useful information on small quantities of experimental polymers. It also provides background information on principles of evaluation, properties and measurements and their significance, the nature and behaviour of polymers and physical characteristics of plastics in relation to each other and to other classes of materials.

Co-ordination Polymers. (PB 121867.) The purpose of the work is to provide research and development on organic metal-co-ordination polymers, which exhibit exceptional thermal stability.

Evaluation of the Dielectric Characteristics of Polyethylene Titanate Blends some Titanate Bodies and Miscellaneous Plastics Materials. (PB 125539.) The dielectric constant and dissipation factor for various concentrations of polyethylene-titanate blends have been measured at 36 and 300–600 megacycles. The effect of the type of titanate, firing cycle, particle size, concentration and moulding techniques were among the variables studied. Criteria for the reproduction of dielectric characteristics for polyethylene titanium dioxide blends have been established. Confirmation of Lichtenecker's Law relating dielectric constant of a mixture to the volume concentrations of the components was obtained. Dielectric data were also obtained for commercially produced nylon and polyethylene titanate blends, colour-graded Teflon, miscellaneous plastics and several low loss waxes.

Tensile Impact Properties of some Plastics. (PB 124336.) The studies of the tensile impact properties of high-polymers reported in PB 107880 for polymethyl methacrylate have been continued on a rigid vinyl chloride-acetate copolymer, two formulations of ethyl cellulose, wood flour filled phenolic and nylon.

Evaluation of Glass Fabric Reinforced Plastic Laminates. (PB 124842.) A programme of evaluation of numerous materials and process variables on the physical, electrical and mechanical properties of glass cloth laminates.

Evaluation of Low-Dielectric Glass Fabric. (PB 121859.) Glass-fabric-base plastic laminates, reinforced with fabric made of low-dielectric glass fibres and standard "E" glass fibres, were evaluated on the basis of mechanical and electrical properties. Six different laminating resins were used.

Low Frequency Induction Heated Resin Plants

AT the O.C.C.A. Exhibition in March, an Induction Heated Pilot Plant capable of carrying out closely controlled esterification and polymerization reactions, was to be seen on the Stand of L. A. Mitchell Ltd.

Low, frequency induction heating as applied to chemical plant, has been known for some time and has been used extensively on the Continent. However, mainly on account of the cost of electricity and the maximum demand difficulties manufacturers in this country, although attracted to induction heating with its obvious advantages, have by-passed it in favour of other cheaper methods of heating. Now, owing to the increase of other methods of heating compared to electricity and the improvements that have been made to the power factor and thermal efficiencies in induction heating, the cost is no longer greater and can in many cases be shown to be less than indirect liquid heated systems.

Basically the equipment consists of a transformer in which the wall of the vessel acts as the secondary. If, for process reasons, stainless steel is required, fabrication would be carried out in clad steel since, of course, it is essential that the vessel is constructed from ferro magnetic material.

In the case of the 10-gallon plant shown in Fig. 2, two banks of coils are used with a total rating of 10 kW, either bank being controlled independently. On the larger reactors between 100 and 2,000 gallons, three banks of coils are used which again can be used independently, i.e. low, medium or high inputs.

The Pilot Plant has been specially designed for compactness and ease of operation. It is complete in every way having its own hydraulic lifting gear for the reactor, vacuum pump and water pump, all set neatly behind the control panel. The vapour tubes, reflux lines and separator can be supplied in glass or stainless steel according to preference. One aspect which everyone concerned with the use of pilot plant will appreciate is the ease in which the reactor can be lowered for cleaning without the necessity to dismantle all the equipment from the head of the reactor.

All plants are fully automatic and have one central control panel. Control is maintained well within $\pm 1°$ C., by means of an Electroflo indicating temperature controller. Also incorporated is an Electroflo multipoint recorder which continuously records the batch temperature as well as the outside wall temperatures on each coil. This enables the differential temperatures between the batch and reactor wall to be observed at all times and at temperatures of 200° C. and above it is as little as 1° C.

The heat input is controlled up to a maximum of 10 kW mainly by an energy regulator which effects its control by periodically switching on and off the power, the ratio of the " on " time to the total time determining the average power input. Between the two limits of the power permanently off and permanently on, the input is continuously adjustable and a linear increase in energy input by rotation of a variable controller, is obtained. The power input, therefore, can be varied from zero to a maximum of 2.5 kW/sq. ft.

The main temperature rise during the heating period is 2.75° C./min. with a full 10-gallon charge and the ordinary working temperature of 250° C. can be reached in approximately 1½ hours. The coils are energized from a 50 cycle, 3-phase, 400 volt supply.

Two current meters on each coil are also incorporated in the control panel together with signal lamps to induction mains " on "/ " off " and for each induction coil power " on "/" off."

Fig. 2. A 10-gallon induction heated synthetic resin pilot plant rating 10 kW.

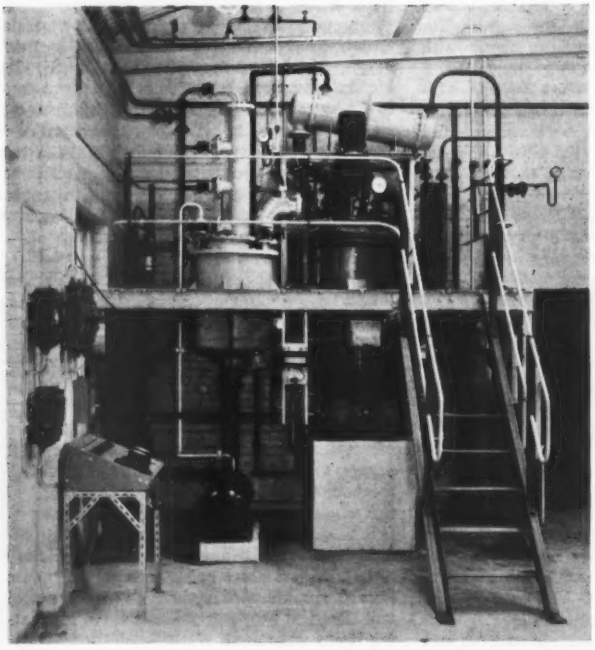


Fig. 1. A 100-gallon induction heated synthetic resin plant rating 75 kW.

Advantages of induction heating can be briefly stated as follows:—

(1) *Flexibility of Batches.* Since induction heating is arranged with two or three banks of coils, and since all coils can be used independently, different batch sizes can be used without the danger of excessive wall temperatures above batch level.

(2) *Control.* Power input can be controlled and measured within fine limits ensuring that successive batches receive the same treatment.

(3) *Fire Hazard.* Induction heating is admirable for operating in flameproof areas. All motors, switchgear, etc., are flameproof and the controls and coils are enclosed in protective casing and can be charged with an inert atmosphere.

(4) *Operating Costs.* On a recent comparison it was established that the cost per gallon to produce a certain resin on a gas fired kettle was 15% higher compared with the same resin made on an induction heated plant.

(5) *Manufacturing Performance.* Due to the complete elimination of local overheating, resins made in an induction heated plant are of a much paler colour.

(6) *Cleanliness.* The cleanliness of an induction heated plant will be evident.

(7) *Maintenance.* Maintenance is negligible, the only possible fault which could occur, would be electrical and this is rectified by an electrician. Overhead maintenance costs which can occur with other heating systems such as leaking glands, flanged joints, loss of heating medium, etc., on liquid heating systems are completely eliminated.

(8) *Compactness.* An induction heated plant is the most compact layout possible and thus full use of available space in a factory is made.

The Use of Plastics in Marine Applications

A report on the Symposium held recently by the Institute of Naval Architects and Institute of Marine Engineers.

A SYMPOSIUM with the above title was organized and held by the Southern Joint Branch of the Institution of Naval Architects and the Institute of Marine Engineers at Portsmouth on April 23 and Southampton on April 24. Preprints of the lectures were distributed before the symposium and this enabled the six lecturers to highlight particular aspects of their paper in their verbal contribution.

Plastics Materials (*V. E. Yarsley, D.Sc., M.Sc.*)

The role of this paper, as the author indicated, was akin to that of a Shakespearean prologue in that it set the scene and gave a technological background to the following papers.

A brief review of the historical development of plastics was given and the concept of long-chain molecules leading to thermoplastic and thermosetting properties was introduced.

In the preprint, each well-known plastics material was briefly dealt with, followed by some consideration of the manipulation of such products. In the lecture itself, Dr. Yarsley highlighted foams and recent developments in polythene. By consideration of such factors as states of polymer aggregation inter- and intra-molecular forces and chain regularity it was shown how, to a large extent, the properties of plastics could be predicted.

The application, economics and future of plastics were briefly surveyed. The reluctance of many industries to accept new ideas in design when changing from more conventional materials to plastics was noted by a speaker in the following discussion. On the other hand representatives from consumer industries complained at the lack of assistance by the plastics industry concerning the supply of creep, stress decay and other fatigue data. Results of long-term tests were very much required. There also appeared to be some concern regarding standardization of parts. It could prove most difficult if a plastics part broke down " on the other side of the world " and no replacements were available. Also dealt with in the discussion were polypropylene, polycarbonates and the use of reinforcing materials.

Plastics in Ships' Hull and Accommodation Spaces (*J. West, B.Sc.*)

The author of this paper prefaced his remarks by noting the three main aims of the ship designer. These were that equipment should be as light as possible (important in respect of both stability and cost of fuel bills), that the cost of components should be stabilized if not reduced by replacement of more conventional materials, and that the equipment installed should require the minimum of maintenance. Plastics materials were advantageous in respect of such factors as design, versatility, often low cost, lighter products, non-corrosiveness and low maintenance requirements.

Large numbers of cabin fittings are now made from plastics materials. Examples given included handles, toilet and curtain fittings, air-conditioning louvres and light fittings. Melamine-formaldehyde crockery was also mentioned. Such products require little cleaning, were unaffected by detergents and did not need to be removed for refurbishing or replating.

The use of laminated plastics for vertical and horizontal surfaces was noted. It was estimated that although the cost of laminates was initially higher than that of painting, after 10 years the cost broke even after taking into account depreciation and taxation credits for repairs and maintenance. The use of the much cheaper p.v.c. " soft " wall covering was discussed. This material was not, however, suitable in busy thoroughfares and on corners because of the inferior abrasion resistance. P.v.c. soft furnishings were useful in upholstery for crew accommodation and for shower curtaining.

Neoprene latex compositions had been found to be of great value for deck covering. Advantages of replacing teak by such floorings included saving in weight and cost, reduction in maintenance, caulking, etc., minimization of steel deck corrosion, greater range of floor colours and greater comfort in walking. Questioned on the non-skid properties of such flooring, the author pointed out that these were very good in both wet and dry conditions. In fact they were so good that many deck games could not be played on them. An interesting development is the manufacture of an insulated flooring employing a plastics foam between the neoprene and the steel deck.

Glass reinforced plastics are finding increased use in ships' fittings such as shower units and cowl ventilators. Results obtained have to date been acceptable but long-term experience is still lacking.

Difficulties regarding cost and thermal properties of plastics pipes were noted and observations were also made on surface coatings and synthetic fibres.

During the ensuing discussion a number of interesting facts came to light. These included the existence of a vinyl-coated nylon for use as a sheathing material with improved abrasion resistance for horizontal and vertical surfaces, the fact that epoxy resin-glass roving pipes had been produced with a hoop stress of 100,000 p.s.i., that foamed plastics were now being experimented with for insulating and acoustical work and that by replacing more conventional materials with plastics, up to 1,500 tons in weight could be saved on a large liner.

Plastic Boatbuilding (*G. Wood*)

The suitability of resin-glass hulls for various types of craft was first dealt with. In the case of dinghies the full advantages of glass reinforced plastics could not be realized due to the fact that the high flexibility of the laminates either required extra wall thickness or the use of sandwich construction. Nevertheless, such dinghies were built and were deservedly popular.

Larger boats up to 56 ft. in length had been built and these were now proving suitable not only for pleasure yachting but also for more specialized work. The main deterrents against sailing yachts were economic. Resin-glass lifeboats have now been accepted by many maritime nations. At the inquiry into the loss of the *Pamir* it was recommended that lifeboats in future should be built of a more resilient

A ladies' powder room on the " Ocean Monarch," panelled in Formica.

material such as reinforced resin. Developments in naval and military craft have been somewhat restricted by paucity of finance.

A number of methods of hull construction have been tried and hand lay-up methods have in this instance been most economical and satisfactory. This would be expected when only small "numbers-off" were required. Dry premises were required for production and for boats over 30 ft. in length temperature control of the works was indispensable.

Subsequent to the paper there was a prolonged discussion which reflected keen interest in the paper. The relative merits of resin-glass, aluminium and wood hulls were discussed at length and this led to a consideration of variability in both wood and resin-glass structures. Two points of interest might be noted in passing. Firstly the statement of a resin supplier that repair kits should last up to 12 months and secondly the belief by the author and some members of the audience that not only did the incorporation of inert fillers give inferior laminates but also that in many cases a false economy was effected.

Plastics in Marine Engineering—Thermosetting Laminates (*J. F. L. Ludgate*)

Phenolic paper and fabric laminates were the main materials described in this paper. After describing the principle and methods of manufacture the author considered the properties of such products.

The low modulus of the laminate was claimed to lead to good shock resistance, compression strength compared favourably with many non-ferrous metals and although the tensile strengths of these products were rather low (9,000–20,000 p.s.i.), it was shown that the strength weight ratio was greater than a wide range of more conventional structural materials. Thermosetting laminates can readily be machined, no cooling or cutting fluid being required. Certain points must, however, be borne in mind such as avoiding tapping and drilling along laminations.

The application of such laminates to marine engineering was considered at length. Uses included stem tube and rudder pintle bearings, engine mountings reducing vibration with little creep, pump bushes, for prevention of electrolytic action, cleats and other yacht components, spheres for air valves and electrical equipment.

An interesting point arising during the discussion was that the expansion of bearings due to water absorption tended to offset wear in use. This phenomenon was not observed with asbestos laminates.

The possible applications of in situ casting of epoxy resins evoked interest. There would appear to be many applications of this material, other than in coatings, for marine application. It was stated during the discussions that ships' propellers had been produced from epoxy glass laminates and from nylon. The new polyacetals and polycarbonates may also prove of interest in this application.

Plastics in Marine Electrical and Electronic Systems (*J. M. Fleming, M.A., B.Sc.*)

There was no fundamental difference between marine and other electrical systems. Two points could be noted, firstly that marine equipment was usually of a low voltage and that a wide range of climatic conditions were to be expected.

It was pointed out that electrical equipment seldom failed due to electrical stressing but that other effects played a great part, e.g., mechanical breakdown, chemical action (e.g., oxidation) and embrittlement. These effects were accentuated by increase in temperature. A comprehensive classification of the thermal stability of many plastics has been developed and has been embodied in B.S.2757 : 1956. This is not a specification but classifies material into groups each of which is associated with a maximum service temperature which will ensure a reasonable economic life in a wide range of apparatus. The only plastics to be found in Class C (the highest class, with stability above 180° C.) were silicone bonded glass fabric, asbestos and mica, and p.t.f.e. In each case there was limited stability above 225° C.

Epoxy resins were of considerable potential interest because of their chemical inertness, toughness, high adhesive strength, low shrinkage on curing and versatility in both handling and final properties. They were being introduced in laminates, castings, coating and adhesive bonded components. For flexible components epoxy esters were at present the most suitable materials in this group, New polyurethene compounds were now available finding use in flexible fabric coatings and for potting and encapsulation. Products are available with a dynamic resilience of less than 8%.

Decorative Laminated Plastics in Ships (*H. S. Newcomb*)

Decorative laminates have been used by shipbuilders for nearly 25 years. Originally their use was restricted to first-class passenger accommodation but with the more favourable cost position and the appreciation of the minimum of maintenance required, these materials are now extensively used in all ships from liners to tugs and colliers.

The durability of the products are dependent on a number of factors, for example, the suitability of the material specified. "Cigarette-proof" laminates with a layer of aluminium foil below the decorative layer are specified for furniture tops. The choice between glossy and matt finishes also depends on a number of considerations.

In addition to the common forms of laminates employing a paper, fabric or wood decorative layer and the cigarette-proof product already mentioned, a number of other forms of decorative laminate are available. These include a post formable product employing a "two-way stretch" crepe paper reinforcement enabling forming in more than one direction, alloy-backed laminates for high strength/low bulk/flame-resisting characteristics and also constructions with plastics foam backings for lightweight applications.

Recommended practices for fabricating and applying decorative laminates according to N.E.M.A. specifications were dealt with in some detail.

The possibility of glass reinforced laminates for translucent decorative work was considered during the discussion. This application is not, however, at present of commercial value.

In summing up at the end of the Symposium, the Chairman asked for two developments from the plastics industry, wear resistant anti-fouling coatings for ships and more fire-resistant products.

Although little in the way of outstanding new developments were noted at the Symposium there were three interesting observations that could be made. Firstly, the shipbuilders were interested in plastic materials in particular because of possible weight reduction, secondly, that in spite of the previous misgivings of many members of the plastics industry (including the present writer) as to the application of glass-reinforced plastics, these materials were being used successfully by boatbuilders using hand lay-up methods, and thirdly, there was a wish by marine engineers that the plastics industry should "look beyond kitchenware" and provide data that would enable plastics to be treated as both engineering and constructional materials.

The crews' recreation room on the collier S.S. "Cliff Quay," where the bulkheads and table tops are covered in Warerite.

Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 6d. each (including postage).

B.P. 792,571. Securing of tufts in ferrules for paint or like brushes. H. Mortimer. To: Usk Patent Products Ltd.

The pre-fused bases of the nylon monofilament bristles are set in a one-piece ferrule of special shape into which the butt of the handle is then inserted.

B.P. 792,574. Phenolic resins and their use in moulding processes. E. Smith. To: Monsanto Chemicals Ltd.

A mixture of a finely divided refractory material and an ammonia-condensed phenol-formaldehyde resin.

B.P. 792,602. Process for the production of moulded bodies. To: Deutsche Gold- und Silber-Scheideanstalt.

It has been found that soft polyvinyl chlorides and shaped bodies made therefrom can be improved by the incorporation of finely divided metal oxides of the 2nd, 3rd and 4th group of the periodic system, in particular aluminium oxide, silicon dioxide, titanium dioxide and zirconium oxide. A further improvement is obtained by stretching the masses during incorporation of the fillers.

B.P. 792,631. Manufacture of laminated plastic sheets or articles. To: Tanins Rey S.A. (France).

A fibrous base (paper; fabric) impregnated with uncured resin is coated on one surface with finely divided metal (aluminium) particles to provide heat conducting properties without filling the pores. Then a second sheet is applied of uncured synthetic resin or an impregnated sheet such as the first sheet and the assembly cured under heat and pressure to cause plastic flow through the interstices obtaining a secure bond between the sheets.

B.P. 792,673. Hose protectors. A. Brice.

For use in Wellingtons and like footwear. The exterior is of smooth finish to minimize rubbing friction.

B.P. 792,681. Ophthalmic mountings. To: American Optical Co. (U.S.A.).

With eyewires having a resilient extensible portion and detachable decorative trims.

B.P. 792,692. Mammary prostheses. E. A. Morris.

Using a bag with a granular mass (granular polystyrene of a specific gravity of 1.04 to 1.06).

B.P. 792,781. Aerosol bomb filling and dispensing valve. To: Scovill Manufacturing Co. (U.S.A.).

The flow rate of fluid in the filling direction is much faster than the flow rate in the discharge direction. The propellant is charged into the container under sufficient pressure to maintain it in the liquid state.

B.P. 792,812. Polymerization of organic compounds. To: Deutsche Gold- und Silber-Scheideanstalt vormals Roessler. (Germany).

It has been found that a system which consists of a solution of suspension of a high-molecular weight substance in a polymerizable monomeric substance (for dental purposes) can be quickly polymerized if organic onium compounds are employed as polymerization accelerators.

B.P. 792,816. Antidazzling disc. S. Suares (Egypt).

Rotating opaque sectors with narrow slits.

B.P. 792,828. Polyethylene compositions. W. G. Barb, D. Mc.Hale. To: Hardman & Holden Ltd.

Incorporating up to 40% (of the polythene) of a very finely divided synthetic sodium alumino-silicate or calcium-silicate reduces tendency to accumulate static electricity and improves rigidity and heat stability. Treatment with high-energy radiation enhances these advantages.

B.P. 792,842. Pressure sensitive adhesives and adhesive tapes. To: Minnesota Mining & Mfg. Co. (U.S.A.).

A carton-sealing tape to be applied from automatic machinery. One hundred (weight) parts of undegraded rubber are blended with 30 to 200 (weight) parts of thermosoftening resinous tackifier. The blend is converted from a suspension of small latex droplets to a smooth continuous viscous rubbery liquid.

B.P. 792,855. Acrylonitrile polymers stabilized with certain β-hydrocarbonoxypropionitriles. A. Abbey. Comm. from: Dow Chemical Co.

B.P. 792,945. Method of reducing the swelling capacity of synthetic alginate skins. To: Wolff & Co., Kom.-Ges. auf Aktien. (Germany).

The skin precipitated in solution of a calcium salt is converted (at least 75%) into the free alginic acid, then reconverted into the calcium alginate. Especially for sausages preserved in dilute solutions of brine.

B.P. 792,954. Polyamide articles and method of production thereof. L. L. Stott, L. R. B. Hervey. To: Polymer Corp.

Two types of nylon powder of different melting points are thoroughly mixed, a filler may be added. The mixture is compressed to the desired shape, then heated to a temperature above the melting point of the lower melting nylon but below the melting point of the higher melting nylon.

B.P. 792,955. Polyamide powder compositions and method for the production thereof. L. L. Stott, L. R. B. Hervey. To: Polymer Corp.

A finely divided moulding powder composed of a first polyamide (polyhexamethylene adipamide) and 15–70% of a second polyamide having a lower melting point (polyhexamethylene sebacamide). The first polyamide portions of the powder at least have particle dimensions no greater than 40 microns. The second polyamide may also be ε-caprolactam.

B.P. 792,976. Laminated sheet material. O.-B. Rasmussen (Denmark).

Two or more "cross-laminated" adhering very thin, uni-axially, cold-stretched single foils of superpolymerizate of the groups nylon, crystalline terephthalates, polyethylene, or crystalline polyvinylidene esters exhibit high resistance to tear.

B.P. 792,980. Synthetic plastic bearing, more particularly for the trunnion pins of universal or like joints. To: Gelenkwellenbau G.m.b.H. (Germany).

Provision of a slipper disc inside the bearing at the end face to prevent direct contact with the lining at the base.

B.P. 792,981. Device for the production of fluid-filled containers of pliable thermoplastic materials. L. Rado.

Containers of different predetermined capacities are produced by making the parts for pressing and welding together opposed walls adjustable so as to determine length and height of the portion of the filled tubing constituting the container.

B.P. 792,995. Epoxide resin compositions and products. To: Minnesota Mining & Mfg. Co. (U.S.A.).

Refers to heat reactive mixtures of epoxide resins and polycarboxylic acid anhydrides which show greatly increased strength at elevated temperatures with added ease and speed of curing.

B.P. 793,002. Production of embossed plywood. Richard Graefe Ltd., K. H. Pearce.

Use of an adhesive to bond the face veneer to the constructional layers which has a capacity for yielding when the face veneer is embossed.

B.P. 793,005. Commodity container. A. Kitada. To: Asahi Kasei Kogyo Kabushiki Kaisha.

A base with a grooved flange to receive resiliently the tubular body having a hook-like peripheral bottom edge to snap into the correspondingly shaped groove. The body has a neck of reduced diameter with a small aperture in the closed top. A cap sprung over the neck enters this aperture with a depending projection.

B.P. 793,015. Packaging material. British Cellophane Ltd. D. A. J. Noble, B. Samways.

Material permitting circulation of air used to be made by punching holes into a sheet or tube. In continuous operation disengagement of the blanks is often difficult apart from wastage. The disadvantages are overcome by feeding the blanks past a number of knife edges cutting short slits.

B.P. 793,036. Process for the production of liquid or paste-filled containers. L. Rado.

The production rate of filled containers of thermoplastic (polystyrene; polyethylene) tubing from filled tubing by welding can be multiplied by using covering sheets of non-thermoplastic material other than metal foil between pressure members and tubing to transfer the heat for welding (add. to: 599,174).

B.P. 793,075. Fishing float. J. R. Thornhill (Canada).

A pair of (plastics) cups fitted mouth-to-mouth over a reinforcing ring. The cups are formed with a central tube open at both ends. The central tubular portions fit together inside the reinforcing ring.

B.P. 793,085. Process and apparatus for the production of colour line rasters and colour rasters manufactured by their use. To: Emi-metal Fabrikations Anstalt (Germany).

Multi-colour laminated block made of several layers of differently coloured (red, green, blue) film material continuously flowed on to a continuously moving base.

B.P. 793,142. Travel and like cases, weltings or edgings therefor. C. H. Plenderleith. To: Foxcroft Luggage Ltd.

Weltings or edgings of extruded pliable plastics.

B.P. 793,163. Closure caps for containers. To: Veri Industriali S.A.R.L. (Italy).

A composite cap with an inner resilient (polythene or polyvinyl chloride) skirted cap clamped by the outer permanently deformable cap under the container mouth.

B.P. 793,185. Surface treatment of thermoplastic film. E. E. Stimson, J. Allan. To: British Çelanese Ltd.

The surface is modified (polished, finely or coarsely embossed) by fluid pressure acting directly on the other surface while the film is in a heat softened condition on an impressing surface and cooled while still in contact with this impressing surface.

B.P. 793,217. Polymerization of tetrafluoroethylene. E. I. Du Pont de Nemours & Co. (U.S.A.).

In the presence of fillers which also act as catalysts.

B.P. 793,220. Resinous compositions. To: Westinghouse Electric International Co. (U.S.A.).

Tough and elastic solid thermosetting compositions of a mixture of a finely divided solid filler of an average particle size below one micron, and a polyester prepared from certain compounds.

B.P. 793,224. Device for coupling together pipes made of plastic material, or for the fitting of end members to such pipes. To: Soc. Française (France).

Polythene pipes are coupled by an outer non-compressible ring with cavities in its inner face and an inner non-compressible ring of small thickness and a slightly tapered portion to be pressed into the pipe to force the plastic material into the cavities of the outer ring.

B.P. 793,265. Polyester and ethoxyline castings. Wayne Kerr Laboratories Ltd., K. A. Fletcher.

For encapsulating and potting of electronic components and assemblies. Use of a polyamide and/or a polyurethane moulding powder of certain fineness as a filler.

B.P. 793,273. Packing material. P. Grcic.

Thermoplastic material is applied in the form of strips to a web of unwoven fibrous material obliquely of the fibres and the materials are then joined by heat and pressure. An air permeable packing material is obtained.

B.P. 793,303. Heatsealing adhesive sheets or tapes. To: Permacel Tape Corp.

A flexible base coated with a mixture of a polymer and 5–80 (weight)% of a crystalline plasticizer having a melting point above 60° C. Polymer and plasticizer form a heterogeneous mixture until heated above that melting point. For mending fabric by using a hot iron on the tape for a short period to soften the adhesive.

B.P. 793,415. Gramophone record albums. J. S. Zandelin (Sweden).

The edge of the casing has such a shape that it will cover the opening when the cover is closed. The casing may be moulded or pressed from plastics.

B.P. 793,430. Non-toxic polyethylene compositions. To: Dow Chemical Co. (U.S.A.).

An efficient anti-oxidant, non-toxic and non-staining, is one selected from the group consisting of nordihydroguaiaretic acid; propyl gallate; and a certain alkyl-phenol compound. The compositions may be used for packaging food.

B.P. 793,441. Process of making sandwich-type laminated materials. A. K. Robinson. To: Sir W. G. Armstrong Whitworth Aircraft Ltd.

A layer of absorbent material (felt) on top of a layer of non-impregnated fabric is used between the vacuum bag and the laminate during its consolidation. The even outer surface is then not spoiled by any excess resin.

B.P. 793,442. A mould for, and a process of moulding, sandwich-type laminate materials. A. K. Robinson. To: Sir W. G. Armstrong Whitworth Aircraft Ltd.

B.P. 793,444. Adhesive bonding. To: B. B. Chemical Co., Ltd. (U.S.A.).

Bonding of polyethylene or polyethylene coated sheets to one another by strands of thermoplastic material including polyethylene unwound from a spool fed to a dispensing machine and through a heated passageway applied to one sheet onto which the second sheet is rolled.

B.P. 793,445. Process for making blown hollow bodies from plastic material. To: Plastics S.A. (France).

The material is extruded as a tube into the mould. The open end of the tube is gripped and closed by means independent of the mould and the hollow body formed by blowing into the tube while simultaneously separating the extrusion nozzle from the end of the tube.

B.P. 793,468. Synthetic resin emulsion for impregnating laminating stock. To: Atlas Powder Co. (U.S.A.).

Water in oil emulsion of polymerisable polyester resin compositions and water-soluble melamine-formaldehyde condensation products.

B.P. 793,480. Holders for photographic transparencies. J. J. Silber.

For use during still projection. Two frame parts each with a window pivoted (with lugs and ribs) at one edge and with a catch at another edge made by pressing or injection moulding from plastic material.

B.P. 793,494. Sound-reflection counteracting fibre boards. To: Svendska Tändsticks A.B. (Sweden).

A stiff porous fibre board having a relative density of 0.20–0.50 with shallow pyramidal cavities depressed into one surface. Over this surface is pressed a layer of a cured thermo-setting binding agent for reinforcing the surface so that the cavities maintain their form. Then a thin covering sheet of porous paper is attached.

B.P. 793,498. Polyvinyl acetate emulsions stabilized with hydro-xyethyl cellulose. E. H. Wright, G. C. Pickard. To: Shawinigan Chemicals Ltd. (U.S.A.).

For water-resistant films and coatings.

B.P. 793,505. Combined shoe-tree and shoe-horn. W. G. C. White.

Integral toe and handle portions with a recess for use of the device as a shoe-horn moulded from plastic material.

B.P. 793,520. Magnetic sound recording tape. B. A. Cousino.

A plastic ribbon (oriented polyethylene terephthalate) with a magnetic coating (minutely divided graphite particles).

B.P. 793,574. Resinous condensation products. To: Rütgerswerke A.G. (Germany).

Phenoplast and aminoplast resins by continuous condensation in the presence of solid ion-exchange resins as catalysts, which are insoluble in the reaction mixture and fixedly arranged in the reaction space.

B.P. 793,589. Process for making polyglycol terephthalates and films made therefrom. To: E. I. Du Pont de Nemours & Co. (U.S.A.).

B.P. 793,595. Plasticized and heat and light stabilized polymeric compositions. To: Union Carbide Corp. (U.S.A.).

Refers to vinyl halide polymers.

B.P. 793,632. Flexible laminated upholstery material. A. C. Hill. To: Pressed Steel Co., Ltd.

Cushions and squabs of vehicle seats are made without stitching from an outer leather or synthetic fabric layer over a layer of plastic foam on a fabric backing joined together by thermoplastic or thermo-setting strips or tapes forming the pleating lines. The bond is then effected by heat and pressure using steam, high frequency or resistance heating.

B.P. 793,673. Preparation of high molecular weight addition polymers of formaldehyde. To: E. I. Du Pont de Nemours & Co. (U.S.A.).

B.P. 793,723. Necktie retaining devices. Z. Wolanski.

A former plate with two wings (plastics) and a support hook (spring wire).

B.P. 793,731. Method of bonding polytetrafluoroethylene. To: E. I. Du Pont de Nemours & Co. (U.S.A.).

The polytetrafluoroethylene surface is dipped into a 1% solution of metallic sodium in anhydrous liquid ammonia, then bonded to metal (plastic, glass, wood) by a phenol-formaldehyde adhesive or an epoxy resin. For electrical insulation, spiral tubing, etc.

B.P. 793,789. Production of artificial sausage casings. B. V. Fox. To: British Cellophane Ltd.

Alginate sausage casings shrinking transversely during frying sufficiently so as to maintain close contact with the filling and remain smooth are made by extruding a viscous aqueous solution of an alginate through an annular nozzle into a coagulating bath of an aqueous solution of calcium. A gel tubular body is formed, which is longitudinally stretched after (partial) setting.

B.P. 793,874. Bonding of metal compounds to synthetic resinous moulded materials. G. W. Rippington. To: Bakelite Ltd.

Rolled copper foil is bonded to moulded compositions (fibrous sheets and phenolic resin) by interposing a layer of an adhesive made of a melamine-formaldehyde resin and a layer of another adhesive for the metal and the melamine-formaldehyde resin layer. The assembly is consolidated by heat and pressure. The moulded compositions may contain fillers (nylon, china clay, paper, glass or asbestos fibres).

B.P. 793,900. Method of and apparatus for capping containers, such as bottles and cups. E. Jensen (Denmark).

For cups, e.g. of soft plastic with a rigid mouth flange to be closed by a thin sheet with a central depression and a rim to be pressed around the rim of the cup.

B.P. 793,032. Water-soluble unsaturated polyester and insoluble polymer obtained therefrom. To: General Electric Co. (U.S.A.).

Polytethylene glycol 600 maleates and fumarates are prepared by a one-step esterifying process using an unsaturated dicarbolic acid or anhydride from the group maleic acid, maleic anhydride, fumaric acid and a second unsaturated dicarbolic acid or anhydride from the group itatonic acid, carbic anhydride. As textile or paper coatings, binders for glass wool, abrasives, laminates.

B.P. 794,083. Containers, particularly refuse containers. To: Carrara & Matta S.p.A. (Italy).

Receptacle and portable casing as plastic mouldings. The receptacle is tilted forwardly into filling position.

B.P. 794,087. Noting device, in particular for telephone numbers. A Zimmermann (Switzerland).

A casing with a reading window and movable character bands to be aligned as desired. Each character is provided with finger stops.

B.P. 794,088. Adhesive bonding and compositions comprising synthetic resinous material for use therein. To: B.B. Chemical Co., Ltd. (U.S.A.).

A reaction product of (*a*) a resinous polyamide of a polymeric polyene fat, and (*b*) a resinous polyepoxide is flexible enough to be unwound from a spool but still sufficiently stiff to be pushed into the passageway of a dispensing machine where the strand is softened by heat to be applied as a tacky film to a workpiece.

When Geigy was 75 years old 1833

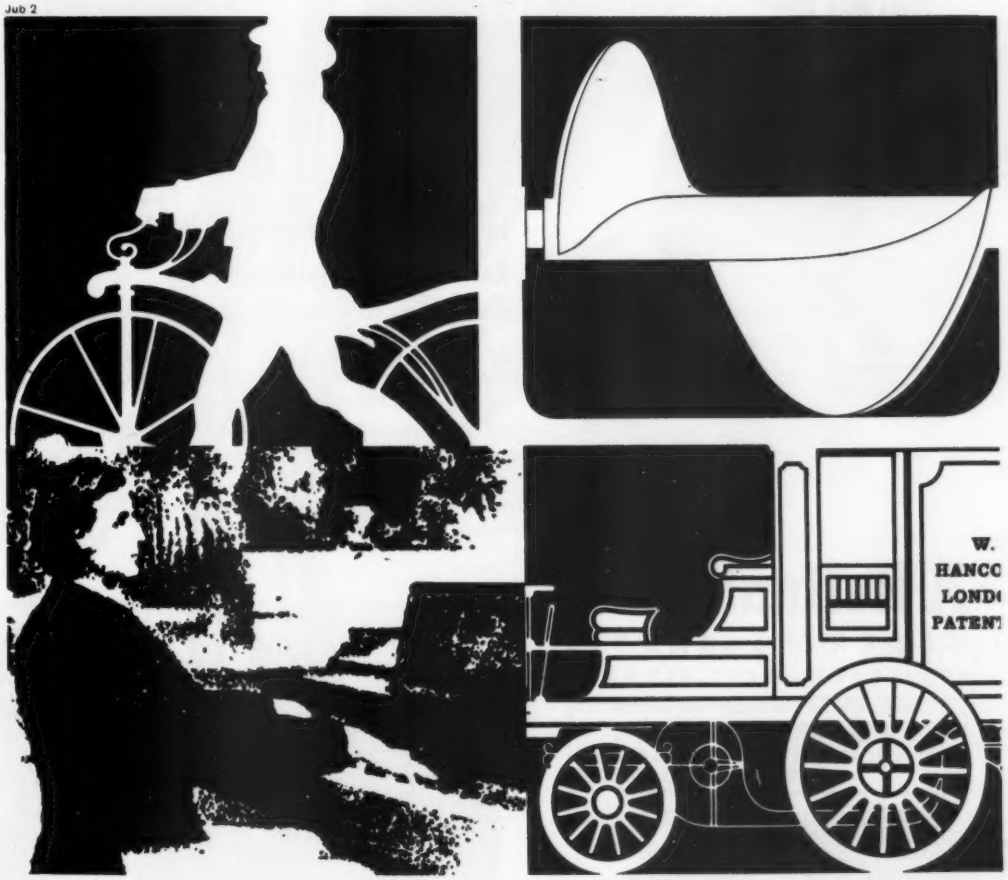
It was the Age of Liberalism in politics, of Romanticism in art. Louis Philippe was King of France. The German States were forming the Customs Union. Belgium had become a national state and the young South American Republics were consolidating their independence from Europe. The Liverpool-Manchester railway was open. Slavery was abolished in the British Empire. Faraday had discovered the basic laws of electrolysis. Runge had isolated aniline from coal tar, and the first photographic moving pictures had been taken. Goethe was not long dead; Stendhal's novels were being read and Chopin's music listened to. Wagner and Verdi were twenty. It was five years since the building of the White House in Washington and the discovery of aluminium, two years since the discovery of the North Magnetic Pole.

In 1833 Geigy, one of the oldest chemical firms in the world, started to operate its first dyewood mill. Imported dyewoods were ground and the dyestuffs sold to the up and coming textile industry.

That dyewood mill was a turning point: Geigy was no longer simply a merchant house and had become a manufacturer. It was the first stage of the firm's expansion into a world-wide enterprise, a concern whose products — like the DDT insecticides and the Mitin mothproofing process — are famous everywhere.

The Geigy Group of Companies today make and sell dyestuffs, pigments and tanning materials, industrial chemicals, plasticisers, pesticides and pharmaceuticals. In the field of organic chemicals the name of Geigy is a mark of quality.

Jub 2



200 years Geigy

Bi. 2.

BOPP

In "The Four Corners of the World" Reifenhäuser Equipment

is valued for its utmost dependability and progress.

In addition to our line of extruders (1¼", 1¾", 2½", 3½" and 6" screw dia.) Reifenhäuser furnishes complete and automatic "package units", for every type of Thermoplastic Extrusion.

Yes, Reifenhäuser Extrusion Equipment enjoys a world-wide reputation for its superior engineering features, its dependability to extrude difficult materials, and its efficiency in operation.

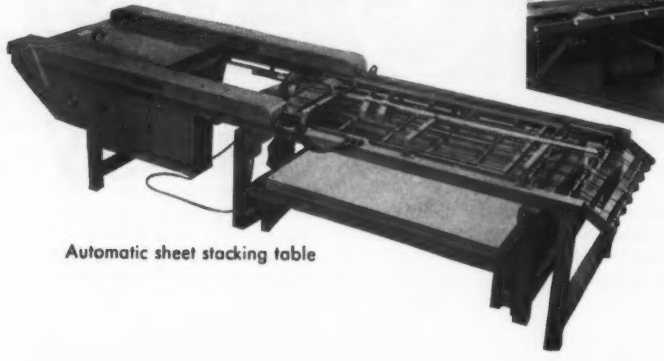
Keep in step with progress by writing us today for full information on the new Reifenhäuser Extruder.

A·Reifenhäuser

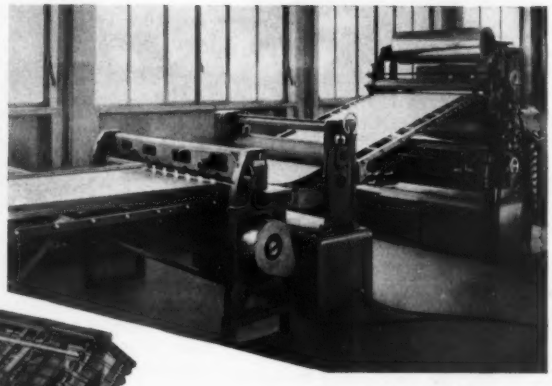
MASCHINENFABRIK

TROISDORF · WEST. GERMANY

REPRESENTATIVE FOR SALES AND SERVICE:
ED. BRAND LTD.
9 ST. CROSS STREET, HATTON GARDEN,
LONDON, E.C.1



Automatic sheet stacking table



The plant for plastic-sheets
– General view –

this Flourishing Plant . .

. . plasticus multiflora

shows typical varieties of mouldings produced from blueprint seeds at our factory in Coventry.

Quantity production available for mouldings, pressings, extrusions for all industries at down to earth prices.

CMS

COVENTRY MOTOR AND SUNDRIES CO. LTD.

SPON END COVENTRY • TEL: COVENTRY 40363-4

582

Which of these seven would YOU use?

Seven steels, developed by Edgar Allen to meet the varying requirements of moulds and hobs for plastics. ★

Extensive research was undertaken in conjunction with famous manufacturers of plastic mouldings before the specifications were finalised to ensure that every possible requirement was met by one or other of the seven.

To make choice of the correct steel easy and certain, Edgar Allen have produced a booklet, which not only gives full details of each steel but also details of the plastic powders for which they are suitable or of the hobbing conditions, with instructions for heat treatment. For a copy of this invaluable booklet write for Publication 41C.

★ **The seven steels are:—**

A13 Mould Steel — for cut moulds and shallow hobs.

Edgar Allen Plastic Hobbing Steel — a general purpose hobbing steel.

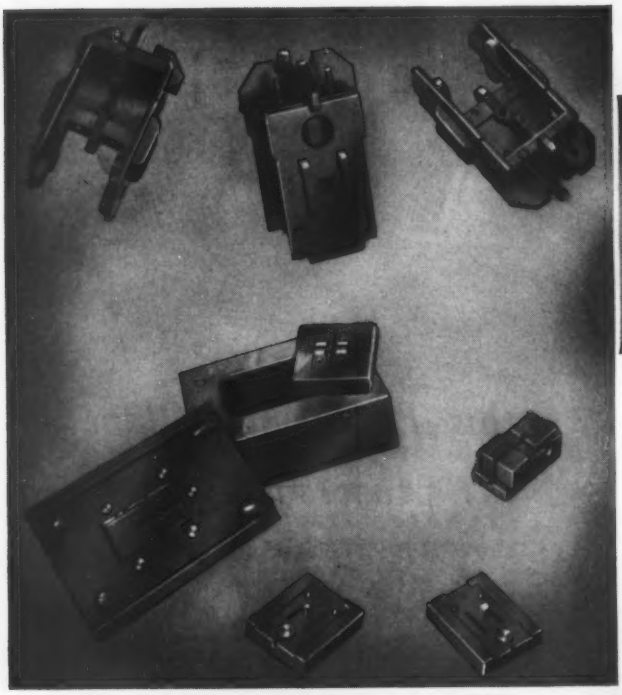
Double Six Master Hob Steel — non-shrinking, through-hardening.

Imperial Stainless Mould Steel — for cut moulds but not suitable for hobbing.

A100 Mould Steel — similar to A13 but cannot be hobbed.

Imperial R.1.0. Stainless Hobbing Steel — a special steel used with urea and other staining powder.

Double Six Die Steel — for moulds that must be hard throughout but are not subject to rough handling, and for injection moulds.



Below — Example of moulds and products made by the hobbing process.

Left — Moulded electrical contact block and mould.

EDGAR ALLEN
DIE STEELS
for
PLASTIC MOULDS

Edgar Allen & Co. Limited
IMPERIAL STEEL WORKS · SHEFFIELD · 9

For this Booklet post the coupon to-day

To EDGAR ALLEN & CO. LTD. PL/TS25
SHEFFIELD 9

Please post data on Die Steels for Plastic Moulds to

Name .....

Position .....

Firm .....

Address .....

WWB

Offer a Complete Service in:

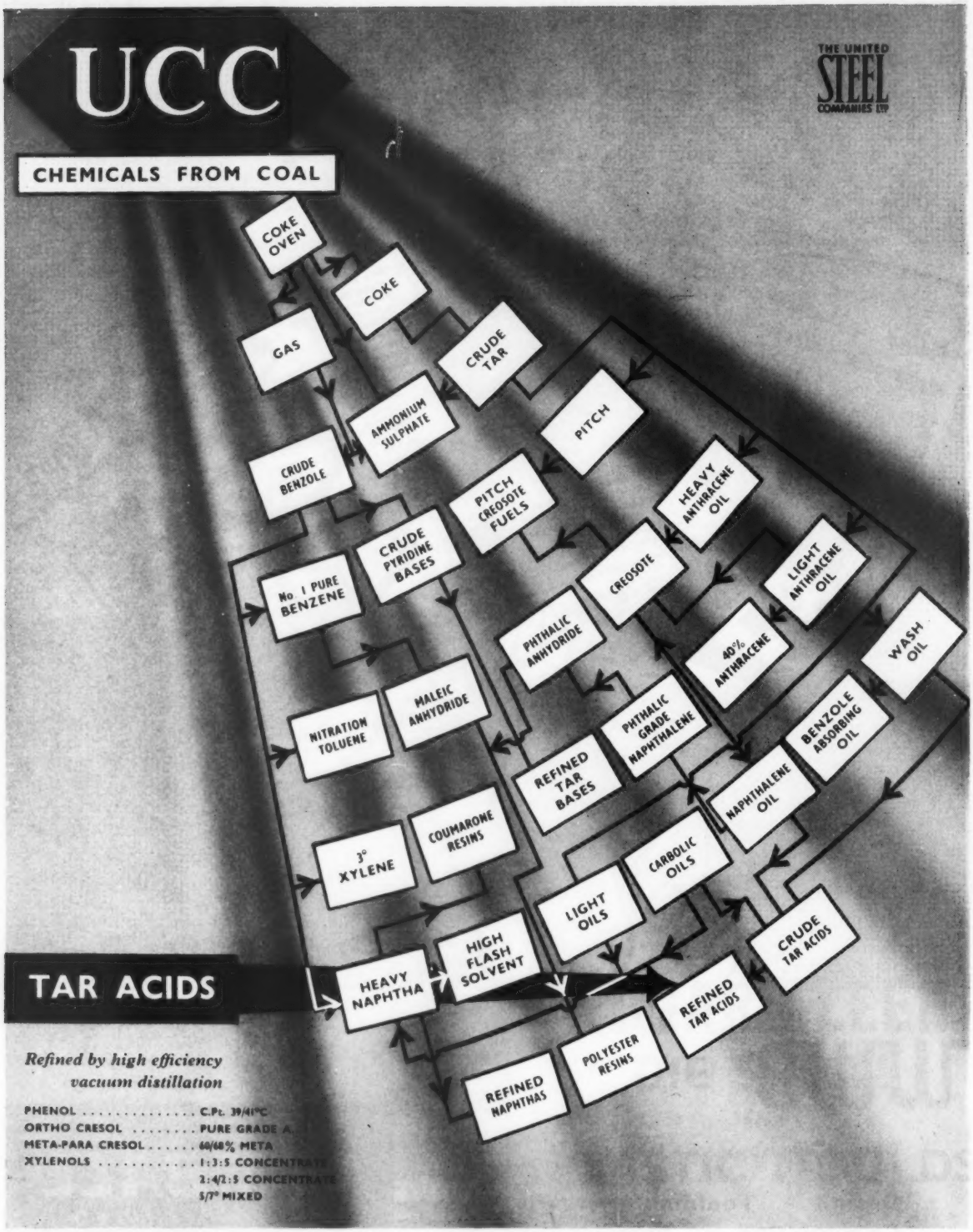
Design · Toolmaking · Engraving
Compression · Transfer & Injection
Moulding · Colour Blocking
Finishing · Assembly & Packaging

Our long experience in the Plastics industry covers over 30 years, you can be assured that the advice we give is sound. Consult us NOW.

W. W. BALL
& SONS LIMITED

KENNEL LANE
BURSTEAD WORKS
BILLERICAY ESSEX

phone: BILLERICAY 1133/4
grams: PLASTOOL BILLERICAY



Enquiries to:

UNITED COKE AND CHEMICALS COMPANY LIMITED

(SALES DEPARTMENT 79) P.O. Box No. 136, Handsworth, Sheffield 13

Telephone: Woodhouse (Sheffield) 3211 *Telegrams: 'Unichem' Sheffield*

UCC9a

Polymers
and
Plastic Materials
are
PROCESSED AND HANDLED IN BULK
by

TOTE SYSTEM

with
ECONOMY, EFFICIENCY AND FLEXIBILITY
used by
I.C.I. · Shell · Monsanto · Goodyear · G.E.C.
Ford · Petrochemicals · Dupont · Fibreglass, etc.
Write for illustrated Brochure

PRESSOTURN LTD. • Leamington Spa, Warwickshire
Telephone: Leamington Spa 7056/7

Razor Pack (Cellulose Acetate)

VACUUM FORMING

THE ESTABLISHED PLASTICS PROCESS FOR

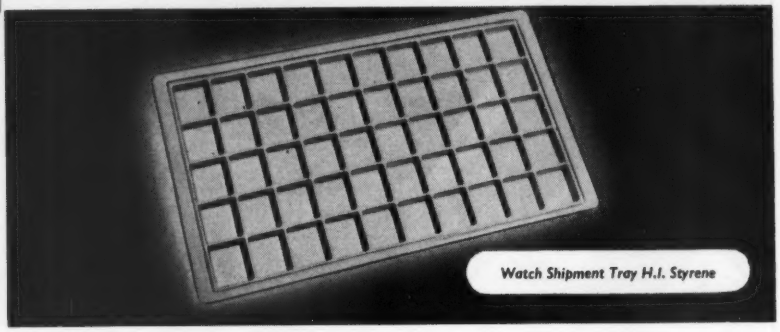
★ LONG OR SHORT RUNS
★ LOW TOOLING COSTS
★ LARGE INTRICATE SHAPES OR SMALL COMPONENT PARTS, PRE-PRINTED IF REQUIRED
★ PACKAGING; ASSEMBLY TRAYS & CONVEYOR BUCKETS; ENGINEERING AND INSULATING COMPONENTS; ADVERTISING DISPLAYS; FANCY GOODS; FURNITURE FITMENTS—from RIGID & FLEXIBLE P.V.C., CELLULOSE ACETATE, HIGH-IMPACT POLYSTYRENE, POLYTHENE —in GAUGES from .005 in. to ¼ in. THICKNESS
★ TRADE WORK WITH CONFIDENCE AND SECURITY

OMEGA PLASTICS LTD

Consult the original Pioneers and Specialists in Vacuum Forming

OMEGA PLASTICS

TELEPHONE:
RIP 3521/2
HIGH BRIDGE ROAD
BARKING, ESSEX

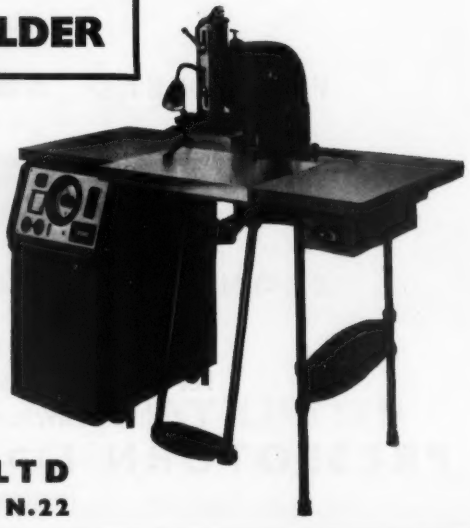

Watch Shipment Tray H.I. Styrene

TEN SQUARE INCHES AND NO FLASH . . !

. . . IN 5 SECONDS

WITH THIS **"ACME" No. 1 H. F. WELDER**

WELDS P.V.C. OR CELLULOSE ACETATE



The "ACME" No. 1 H. F. WELDER can weld the above 10 square inch area or 80 linear inches, on two thicknesses of 0·018 inch P.V.C. Alternatively it can weld 50 inches on 0·004 inch P.V.C. All this with only 1·5 kW . . . and NO FLASH . . . even with inches of overhang.

★ We will gladly demonstrate the truth of these statements if you will write or telephone for an appointment or we shall be pleased to forward further details on request.

BOWES PARK 8424/5

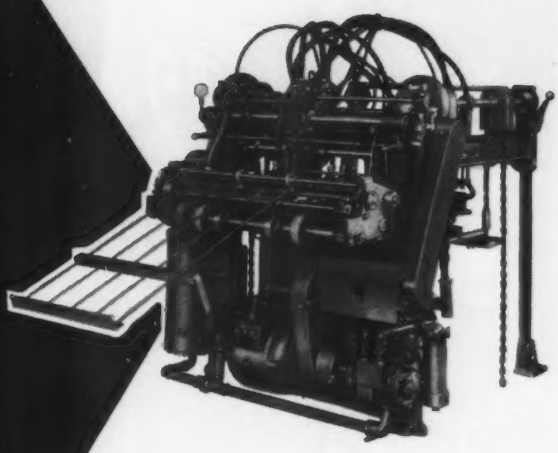
H. F. INDUSTRIAL SERVICES LTD
317-319, HIGH ROAD, WOOD GREEN, LONDON, N.22

JACW/P/2

Faster Sheet Handling

of Metal, Plastic and Cardboard with

CRABTREE FEEDERS AND STACKERS



A Product of the CRABTREE GROUP. Designers and Builders of Printing Presses.

These versatile machines are designed to handle sheets of any suitable material, and will feed to, or stack from, production machines, inspection lines and conveyor lines at speeds up to 8,000 sheets per hour.

Continuous operation is achieved by a special device, which permits the feeder to be reloaded whilst actually in operation.

Crabtree Feeders and Stackers are well established, and considerable numbers are in use all over the world.

If we can help you with your feeding or stacking problems, please write us. We will gladly send complete information, or our technical representative will call on request.

Standard machines are immediately available for the following maximum sheet sizes:

36″ x 29″	(First figure width across feeder)
36″ x 36″	,, ,, ,, ,, ,,
40″ x 38″	,, ,, ,, ,, ,,

Special machines are available for sheet sizes up to 48″ x 120″. (First figure width across feeder)

A Typical Fully Automatic Slitting Layout

Stacker *Slitter* *Feeder*

R. W. CRABTREE & SONS LIMITED

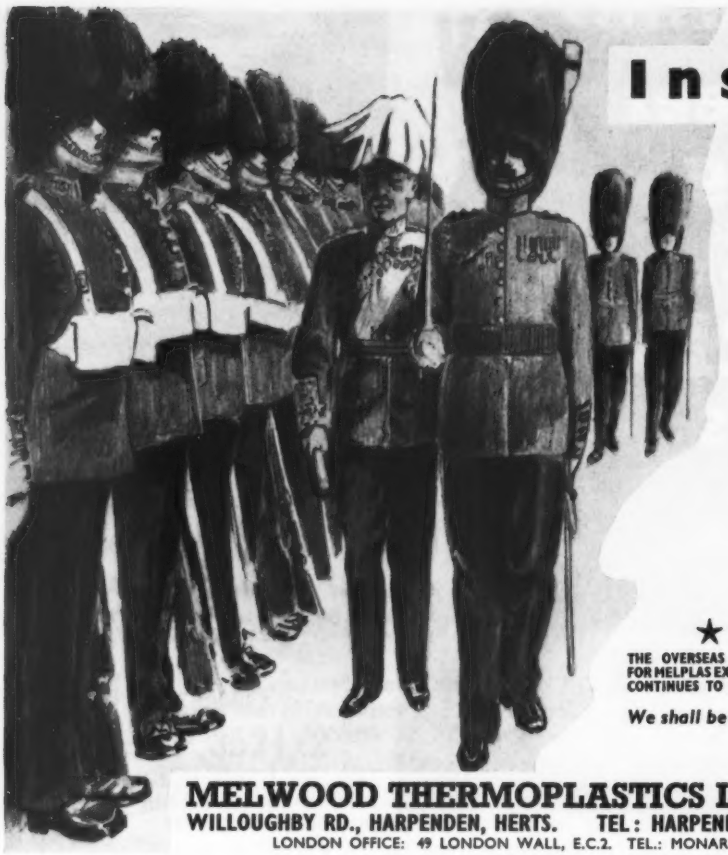
BREN MANUFACTURING COMPANY

Team Valley, Gateshead, 11 Telephone: Low Fell 75071

London Office: 109 Borough Road, LONDON, S.E.1. Tel: WATerloo 7401

Leeds Office: Water Lane, LEEDS, 11. Tel: Leeds 32424

M



Inspection...

whether military or industrial, ensures that a uniform high standard is constantly maintained. In industry—and particularly in Extruded Plastics—meticulous inspection offers the additional advantage that improvements and economies can be immediately recognised and implemented.

In Extruded Plastics consistent dimensional accuracy is imperative because the product is frequently required, sometimes thousands of miles away★, to be used in conjunction with other materials to specified measurements. Regular inspection throughout each run ensures a thoroughly satisfactory product.

EXTRUDED THERMOPLASTICS IN RIGID AND FLEXIBLE P.V.C. ACETATE, POLYTHENE AND POLYSTYRENE

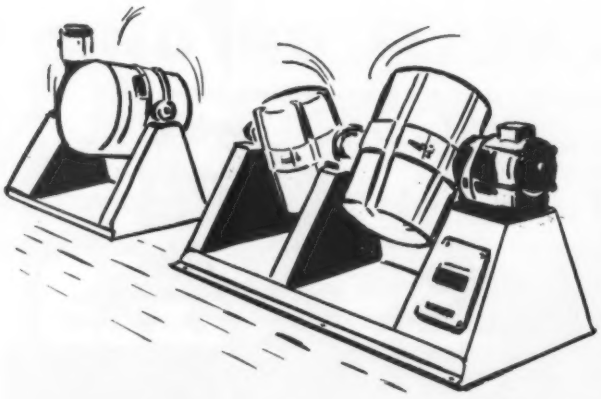
★ THE OVERSEAS DEMAND FOR MELPLAS EXTRUSIONS CONTINUES TO INCREASE

We shall be glad to send you a copy of our illustrated catalogue of Melplas Extrusions.

MELWOOD THERMOPLASTICS LIMITED
WILLOUGHBY RD., HARPENDEN, HERTS. TEL: HARPENDEN 300 & 311
LONDON OFFICE: 49 LONDON WALL, E.C.2. TEL.: MONARCH 6862

MELPLAS EXTRUSIONS

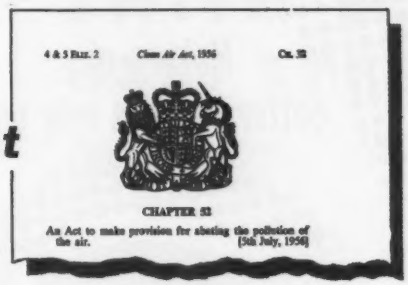
Mixing business with pleasure....



is generally considered a crime, except where the two blend harmoniously as in the use of our TUMBLEMIX mixing machine. Then business truly becomes a pleasure. Try it and see . . .
Illustrated leaflet on request to:—

P. & L. MILLER LTD

HENEAGE STREET, BRICK LANE, LONDON, E.1 BISHOPSGATE 7314 (5 lines)


4 & 5 ELIZ. 2 Clean Air Act, 1956 Ch. 52

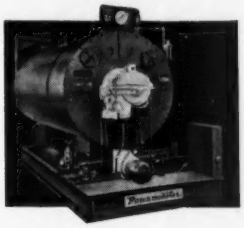
CHAPTER 52

An Act to make provision for abating the pollution of the air. [5th July, 1956]

The Clean Air Act

HOW *Powermaster* CAN HELP YOU

On June 1st the Clean Air Act came into force. From this date no furnace or boiler may be operated or installed within a smoke control area unless it can be operated continuously without emitting smoke. If your firm is one of the hundreds who have installed Powermaster Packaged Oil-fired boilers you have nothing to worry about, for the Powermaster is completely smokeless in operation.
If, however, like many others you are still operating an old-fashioned, uneconomical smoke-emitting installation you will, by law, have to take steps to modify it.



Now is the time to consider the outstanding advantages of the POWERMASTER PACKAGED OIL-FIRED BOILER

The first British built Multi-pass fire-tube packaged boiler, the Powermaster, was introduced in 1954 and was an outstanding success from the start. One of its chief characteristics is completely smokeless operation. There is no smoke, no dirt, no soot, no ash removal. Available for oil, gas or combined gas/oil firing, the Powermaster has a thermal efficiency of over 80% even when running at less than full capacity. This means considerably reduced fuel costs.
Installation is simplicity itself. The Powermaster is delivered to your works ready for immediate connection. The Powermaster incorporates the Voriflow burner, one of the finest in the world operating at the highest possible efficiency with a minimum of trouble.
Powermaster Packaged Boilers are available in a range with 500-21,000 lbs. steam per hour with pressures of up to 250 p.s.i. The simplest, cheapest and most efficient way of complying with the Clean Air Act is to install Powermaster boilers. Literature is available on request.

HERE'S WHAT THE *Powermaster* OFFERS YOU:-

- Takes up to 50% less space than conventional boiler unit.
- Simpler installation
- Reduced fuel costs
- Correct fuel/air ratio on all loads
- Over 80% efficiency — with the VORIFLOW oil burner
- Smokeless operation
- Rapid start up

POWERMASTER BOILERS ARE AT WORK IN SUCH WELL-KNOWN FIRMS AS BORG WARNER, KAYSER BONDOR, GLAXO LABORATORIES, COW & GATE, JOHN LEWIS LTD., AND MANY OTHERS.

"STEAM COSTS GO DOWN WHERE POWERMASTER GOES IN"

GWB **G.W.B. FURNACES LIMITED** Boiler Division
P.O. BOX 4, DIBDALE WORKS, DUDLEY, WORCS. Telephone: Dudley 4284/5/6/7 and 5081/2/3/4/5
Proprietors: Gibbons Bros. Ltd., and Wild-Barfield Electric Furnaces Ltd. GWB 219

Makers of
Better Plastics rely on

VICTOR BLAGDEN

CHEMICALS
for the Plastics Industry

•

FORMALDEHYDE
manufactured by the B.N.R. Company, Barking

META CRESOL
manufactured by P.R. Chemicals Ltd. Silvertown

PHENOL 39/41°

Enquiries to the Sole Selling Agents:-

VICTOR BLAGDEN & Co Ltd
PLANTATION HOUSE, MINCING LANE, LONDON, E.C.3
Telephone: MANsion House 2861 (6 lines)
Telegrams: BLAGDENITE FEN, LONDON
Norwich Union Building, City Square, Leeds. Telephone 28236

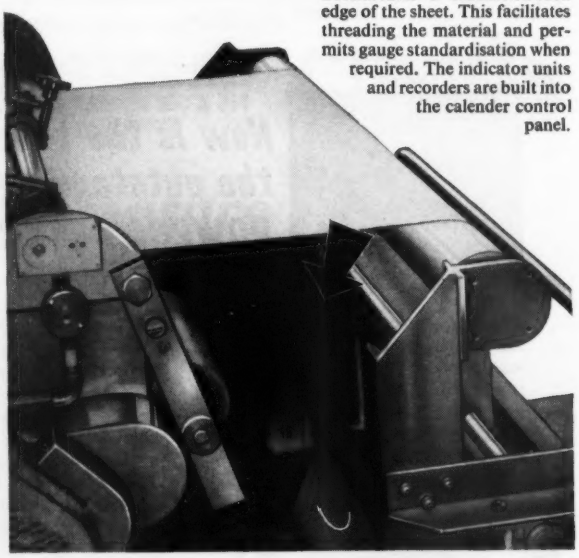
BX PLASTICS LTD use

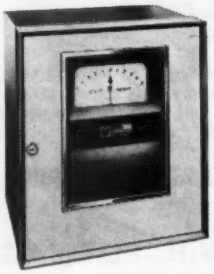
EKCO nucleonic gauges

BX PLASTICS LTD. use EKCO Nucleonic Gauges in the production of P.V.C. sheet in thicknesses from .002" to .010". Separate indicators provide an accurate (in the order of 1%) and continuous indication of the thickness at each edge of the sheet after calendering and recorders produce permanent records of thickness variations. This cuts start-up time and facilitates rapid changes of specifications when required.

EKCO Nucleonic Gauges—robust, reliable and extremely simple to operate—are saving this Company and many others in Britain and overseas, really significant sums of money.

A measuring head is mounted on a retractable 'U' bracket on each edge of the sheet. This facilitates threading the material and permits gauge standardisation when required. The indicator units and recorders are built into the calender control panel.





EKCO
NUCLEONIC
GAUGES
can step up the
efficiency of your plant

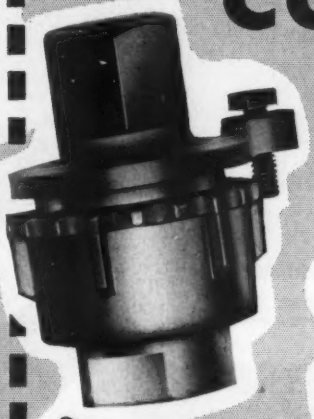
Southend 49491
EKCO ELECTRONICS LTD · EKCO WORKS · SOUTHEND-ON-SEA · ESSEX

The answer to many flexible pipeline problems

J.R.H.

SWIVEL & BALL TYPE PIPE COUPLINGS

STRAIGHT THROUGH SWIVEL



SINGLE SWIVEL

DOUBLE BALL

(Patent Nos. 614876 & 625612.)

DURABILITY of Rigid Pipe with FLEXIBILITY of Hose...

Simplicity of design and ease of maintenance are outstanding features of J. R. H. Pipe Couplings which allow for reciprocating or rotary movement on pipe joints for Water, Steam, Air, etc. Full pipe section is maintained through 360° for tested working pressures up to 300 lbs. p.s.i. (steam) at 500° F.

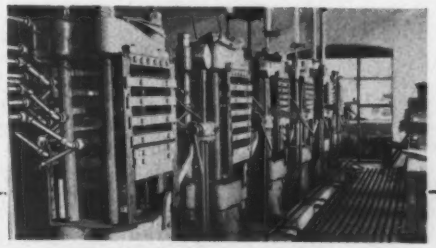
APPLICATIONS INCLUDE: Steam-Heated Platen Presses, Mixers and Kettles, Printing Machines, Gramophone Record Presses, Oil Supply Lines, etc.

Packing adjustment may be effected while coupling is under working pressure. (Special moulded packings in compressed Asbestos, Metallic Foil, or P.T.F.E. are employed).

● ***NEW PACKINGS CAN BE FITTED WITHOUT DISMANTLING PIPELINES***

SOME PRESENT USERS...

B.I.P. Chemicals Ltd.	Oldbury.
George Cohen, Sons, & Co., Ltd.	London & Leeds.
T. H. Dixon & Co., Ltd.	Letchworth.
T. H. & J. Daniels Ltd.	Stroud.
Goodyear Tyre & Rubber Co., Ltd.	Wolverhampton.
Rubberware Ltd.	Harefield.
Francis Shaw & Co., Ltd.	Manchester.
Thompson & Son (Millwall) Ltd.	London.



★ *Please write for illustrated booklet*

Available from

J.R.H.

PRODUCTS & COMPANY LIMITED

St. Leonards Road, Windsor, Berks.

and

BELLS ASBESTOS & ENGINEERING LIMITED

All the year round ...

there is a demand for printed plastics, and it increases steadily as more and more trades and industries realise that they cannot do without them. Calendar cards like these are just one example of our very wide scope. We can make anything from sliding or circular calculators to adjustable price tickets or calendar cards—in any shape, any size, any number of colours. The time is sure to come when you need printed plastics; when it does you can't do better than contact:

U.K. PLASTICS LTD.
ESTABLISHED 1911
KINGSTON-BY-PASS, SURBITON, SURREY
Telephone: ELMbridge 2814-5 *Telegrams:* Celluprint, Surbiton

EVERY TRADE NEEDS PLASTICS

'SKYLON'
POLYTHENE
THIN WALL CARBOYS
IN
5 gallon
10 gallon
&
15 gallon capacities

●

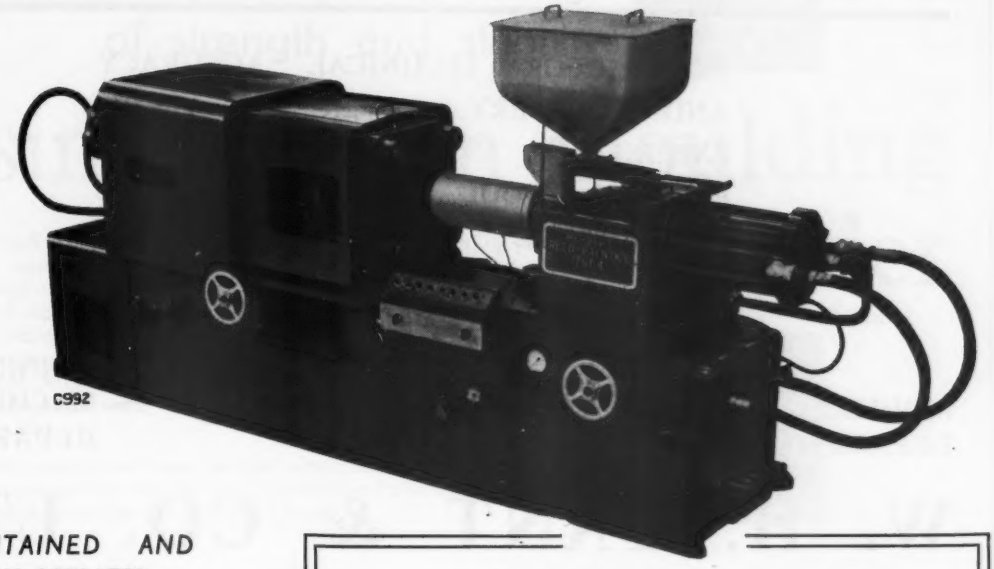
Wire cages and armoured metal drums also available if required.

ACORN **FIBRENYLE LTD** 5073/4
157, DUKES ROAD, WESTERN AVENUE, LONDON, W.3.

JACW/C/1

HERBERT/REED-PRENTICE

injection moulding machines



- *SELF-CONTAINED AND HYDRAULICALLY OPERATED*
- *MANUAL, SEMI- OR FULLY-AUTOMATIC OPERATION*
- *DOUBLE-SHOT MECHANISM TO INCREASE CAPACITY*
- *LOW-PRESSURE MOULD CLOSING DEVICE FOR MOULD PROTECTION*
- *CORE PULLING CAN BE FITTED*

Three models available:—

	175T	10D	400T
Weight moulded per shot (Acetate)	4 oz.	8 oz.	16 oz.
Weight moulded per shot with double-shot (Acetate)	... 6 oz.	14 oz.	22 oz.

We also offer:— The Edgwick "HY" injection moulding machine for plastic components up to 1½ ozs. in acetate or 2½ ozs. with double-shot mechanism.

A complete range of compression moulding presses and equipment manufactured by T. H. & J. Daniels Ltd., Stroud, Glos. Specialists are available to assist in solving your moulding problems.

Special feature . . .

Low-Voltage Induction Heater

The Herbert Low-voltage Induction Heater complete with transformer. This heater can be fitted to machines already in use.

- *MORE ECONOMICAL THAN RESISTANCE HEATERS*
- *25% TO 30% INCREASE IN PLASTICISING*
- *RAPID WARM-UP FROM COLD AND TEMPERATURE CONTROL MAINTAINED WITHIN ±1°F*
- *UNIFORM HEATING THROUGHOUT BODY AND TORPEDO*
- *HEATING ELEMENTS ARE INDESTRUCTIBLE IN NORMAL USE*

Sole Agents:—

ALFRED HERBERT LTD., COVENTRY – FACTORED DIVISION, RED LANE WORKS

A.D.352

Pioneer Plastic House

NOTED FOR TECHNICAL ACCURACY AND DELIVERY. OVER 40 YEARS' EXPERIENCE. WE POSSESS A WELL EQUIPPED TOOL ROOM AND DEAL WITH REALLY DIFFICULT SUBJECTS.

Address enquiries to

MOULDING DEPARTMENT ← → **TURNING AND MACHINING DEPARTMENT**

W. H. TANT & CO. LTD.

DOLLMAN STREET, BIRMINGHAM, 7

Phone: ASTon Cross 3232

Are you extruding —

if so

you need the sensational new

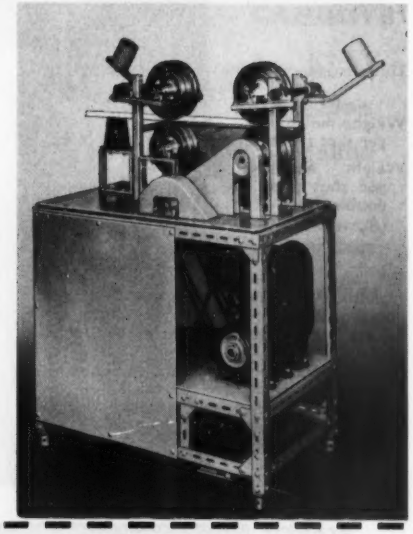
"PLASTO" HAUL-OFF

(Model PN/303)

Fitted with the famous Carter-Croft Variable Speed Gear and our special sectional (Patent applied for) Pulleys which ensure the most effective surface grip on shapes which are difficult to hold. An extra set of plain rubber-bonded Pulleys are supplied for taking-off strips of regular contours.

Tubing up to 2" dia., can also be hauled on this machine. We design any type of Die Head, Die, Sizing Die, Cooling Tank; Roving Saw and Coiling Gear to suit customers' requirements.

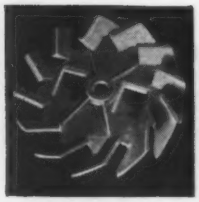
Send your problems for our solution



The Pioneer Ancillary Equipment People:—
Grams: Jiggentool, Luton, Beds.
Phone: Luton 6029

PIECE - PARTS & ASSEMBLIES
112 MIDLAND ROAD · LUTON · BEDS

for lightweight
precision mouldings
of strength and stability



Ralsin

Ralsin injection moulding powder

(NYLON 11)

Even by current high standards, Ralsin (Nylon 11) injection moulding powder is exceptional—and custom moulders will quickly acknowledge the fact. Ralsin precision mouldings—strong, lightweight and dimensionally stable are already being applied with singular success in the fields of accountancy and computing machinery, automotive engineering and textiles. Gears made from Ralsin are silent, self-lubricating; a slight 'give' in the material permits perfect engagement and protracted use without wear. Ralsin has excellent electrical insulation properties, is indifferent to water, heat and cold and will withstand temperatures of 100°C continuously.

What the custom moulder will want to know about Ralsin moulding procedure, physical properties and special suitabilities, is contained in Publication No. TD/R/2. Engineers and Designers are invited to request a copy.

These are the outstanding advantages of Ralsin

Low water absorption.
Dimensional stability.
Excellent mechanical properties.

WHIFFENS
A member of the Fisons Group of Companies
chemicals for industry
WHIFFEN & SONS LIMITED,
FISON HOUSE, 95 WIGMORE ST.,
LONDON, W.1
Telephone: Welbeck 5500
Telegrams: Whiffen, Wesdo, London

W18

INJECTION MOULDING NEEDS FOSTER CONTROL

Three Foster model 3552 temperature indicating controllers, part of a large order supplied to Messrs. Foster, Yates and Thom of Blackburn for use with their W700 Low Pressure Injection Moulders

These instruments provide a simple, reliable and inexpensive temperature control system for most injection moulding processes. The standard instrument has On/Off control, but an attenuated input form of control is now provided. This form of control is particularly important where the maintenance of 100% heat input up to the set point is inadvisable or detrimental.

Full details of Foster controllers will gladly be sent on request.

FOSTER

RESILIA FOSTER INSTRUMENTS

FOSTER INSTRUMENT CO., LTD., LETCHWORTH, HERTS
Telephone: Letchworth 984/5/6

When economy counts and hygiene is essential—
specify . . .

Homalloy LIGHT ALLOY REGD

PLASTIC DELIVERY VANS

For reasons of strength and economy, the cab forms an integral part of the Homalloy van body built on this Morris L.C.F. O-M Chassis. The side panelling and roof of the body are constructed in plastic.

Homalloy LIGHT ALLOY REGD —designed vehicles give you better service too!

HOLMES (Preston) LTD. BLACKPOOL RD. PRESTON • ENGLAND

TELEPHONE: PRESTON 89233 (5 lines) • TELEGRAMS: HOMALLOY PRESTON

RHODESIA — Zambesi Coachworks Ltd., Private Bag 25, Kopje, Queensland. Telephone: 24353

SOUTH AFRICA — Bus Bodies (S.A.) Limited, P.O. Box 4008, Port Elizabeth. Telephone: 87436

CRYSTIC AND MARCO

Pioneer *Polyesters*

Scott Bader have been manufacturing polyester resins since 1946 and we are proud of the prominent part which we and our customers have taken in developing the Glass Reinforced Plastics industry.

Scott Bader polyesters are made under ideal conditions at our Wollaston Garden Factory in a plant which has been specifically designed for the production of consistent high quality polyester resins.

A team of young and energetic research workers ensure that **Scott Bader** continues to lead in all technical matters connected with polyester resins.

Technical service staff specially trained in the handling of polyester resins are always ready to give prompt and helpful assistance to customers.

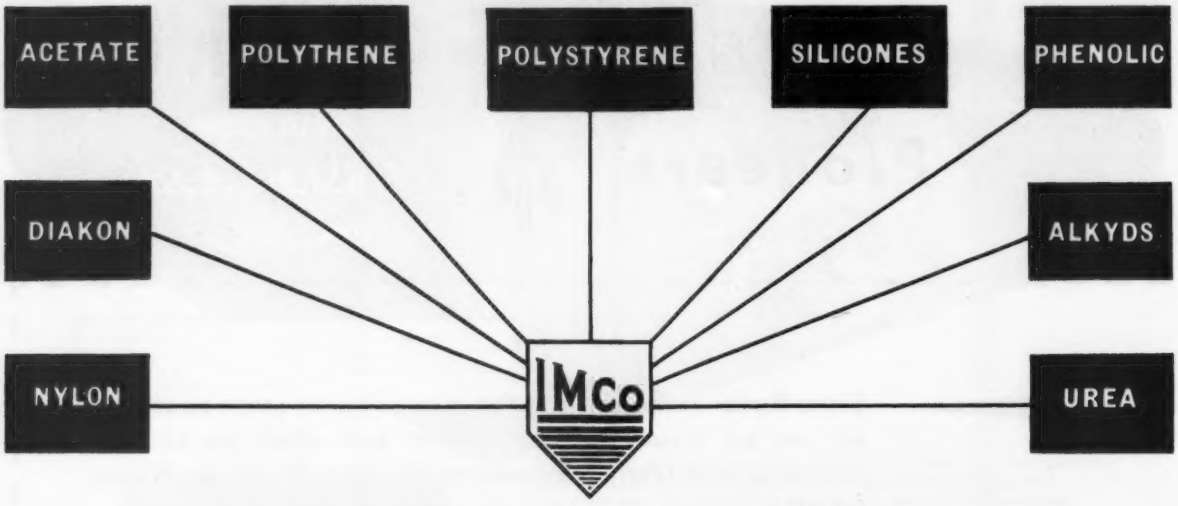
Scott Bader polyester resins are being used throughout the world.

SCOTT BADER & CO LTD

Polyester Division

Wollaston Wellingborough Northamptonshire Telephone Wollaston 262
London Office—109 Kingsway London WC2 Telephone HOLborn 3691

We are specialists in the moulding of all these materials



A.I.D. APPROVED. CONTRACTORS TO GOVERNMENT DEPTS.

INSULATION MFG. CO. (PLASTICS) LTD.

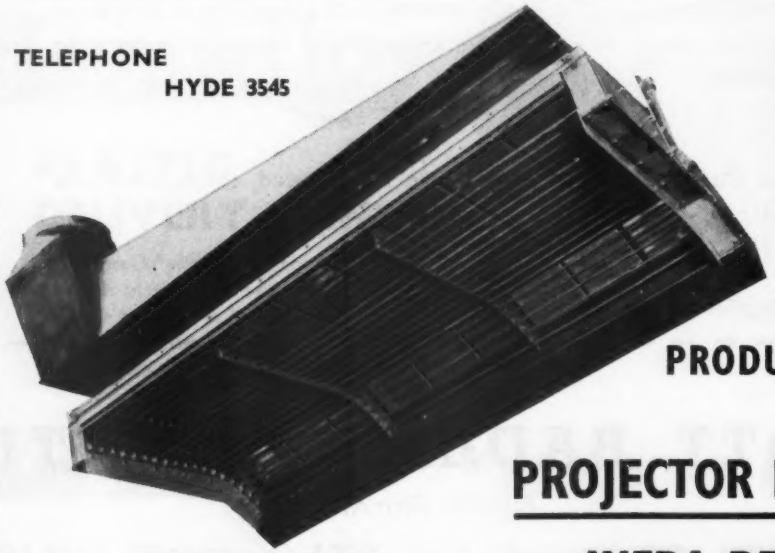
IMCO WORKS, GEORGE ST., GLASTONBURY, SOMERSET

Phone and Grams: GLASTONBURY 2258

INDUSTRIAL INFRA-RED LTD.

TELEPHONE
HYDE 3545

ONWARD WORKS
MANCHESTER ROAD
HYDE, CHESHIRE



SPEED UP
PRODUCTION BY USING

PROJECTOR ELEMENT TYPE

INFRA-RED HEATERS

SEND FOR FURTHER
PARTICULARS

Making the most of a CONFOUNDED nuisance...

Colt CO.4080 Ventilators at Fibreglass Ltd., St. Helens, Lancashire.

Fibreglass Ltd., of St. Helens, Lancashire, were faced with the problem of process heat. Whilst planning the installation of a new glass melting tank, their engineers foresaw the possibility of overheated working conditions, and decided to solve the problem before it occurred. Already familiar with Colt Equipment, they proposed a ventilation scheme, and consulted Colt.

Following this consultation, the system shown here was installed. In it, Colt Clear Opening Ventilators utilise the power of the thermal currents rising from the plant, to extract the offending heat, rapidly and continuously. This extraction sets up cooling air movement throughout the entire area, reducing the working level temperature, which in turn prevents the loss of output that is the inevitable result of overheated conditions.

Let Colts help you to use the heat you have already paid for so dearly, to provide you with NATURAL VENTILATION.

Colts have learned through long experience that no two ventilation problems are the same, that each has its peculiarities, its special requirements. Our Technical and Advisory Staff are always ready to give your problem the special attention it deserves ; to adapt the practical experience of many years to your specific needs. This service, incidentally, is offered without charge or obligation.

Let Colts solve YOUR problem.

Send for Free Manual on Colt Ventilation to Dept. AD10/7

COLT

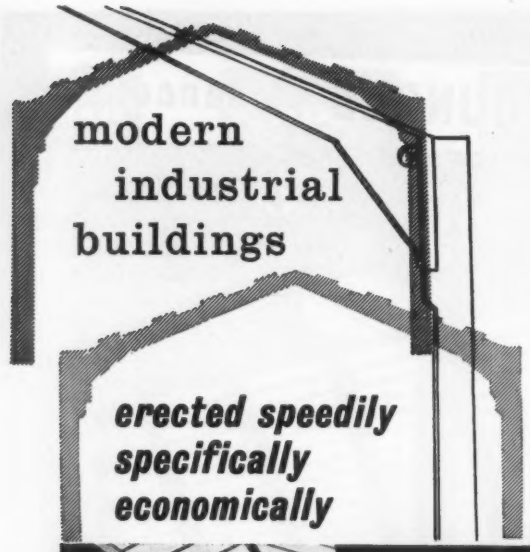
VENTILATION

COLT VENTILATION LTD · SURBITON · SURREY

TELEPHONE: ELMBRIDGE 6511 (10 lines)

U.S.A. Subsidiary: Colt Ventilation of America, Inc., Los Angeles.

Branches at: Birmingham, Bradford, Bridgend (Glam), Bristol, Dublin, Glasgow, Leamington Spa, Liverpool, London, Manchester, Newcastle-upon-Tyne, and Sheffield. • Agents in: Australia, Belgian Congo, Belgium, Burma, Canada, Cyprus, India, Indonesia, Madagascar, Malaya, Mauritius, New Zealand, Pakistan, Portugal, Rhodesia and Nyasaland, South Africa, and West Indies. G 685



If you are considering factory premises, study the advantages of Tyler Pre-Cast Reinforced Concrete Buildings. Tylers are specialists in this field, and the skill and experience of many years of development and research is self-evident in every structure they produce. Design is practical, finish is clean and "marble" smooth, and erection — by Tyler's own skilled teams — speedy and simple.

Tyler Buildings are manufactured in accordance with current British Standard Specification Code of Practice C.P. 114/57.

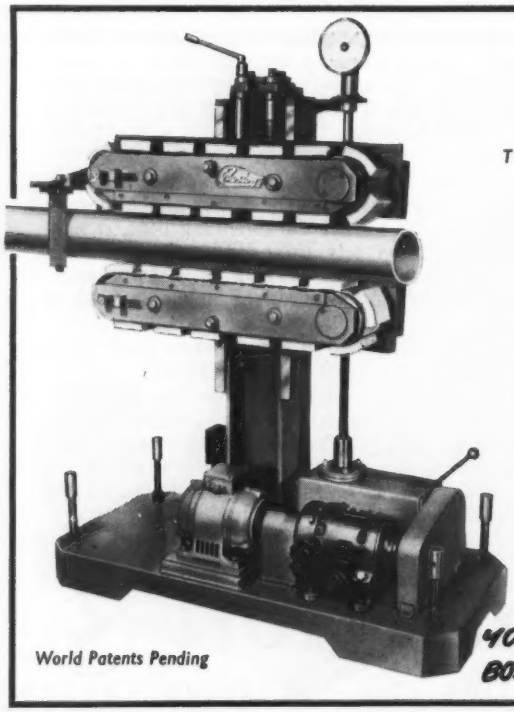
For swift expansion of premises with the minimum of inconvenience for saving of time and money, for a really well-designed building — you cannot do better than get in touch with Tyler. Please write for literature.

PRE-CAST REINFORCED

CONCRETE BUILDINGS

TYLER
TONBRIDGE

E. W. TYLER & CO. LTD. Bridge Works: Tonbridge, Kent. Phone: Tonbridge 4024/5



World Patents Pending

THE BOSTON UNIVERSAL 'TAKE OFF'

THE EIGHT STAR MACHINE WHICH MEETS ALL YOUR NEEDS

- ★ Hauls off all tubes and profiles—rigid, brittle or flexible.
- ★ Instantly adjustable for any size or profile with unskilled labour. No taper rollers to adjust and synchronize.
- ★ Powerful positive non-slip dead centre line haul-off.
- ★ Obviates trial runs. No time or material wasted in starting up.
- ★ One hundred per cent. consistency.
- ★ One hundred per cent. perfect quality.
- ★ Compact and requires little floor space.
- ★ A fine engineering achievement—fully guaranteed.

THESE POSITIVE FEATURES SAVE YOU LABOUR AND MAINTENANCE COSTS, AND AVOID STANDING TIME

2 STANDARD MODELS | 0— 6" 0—10"

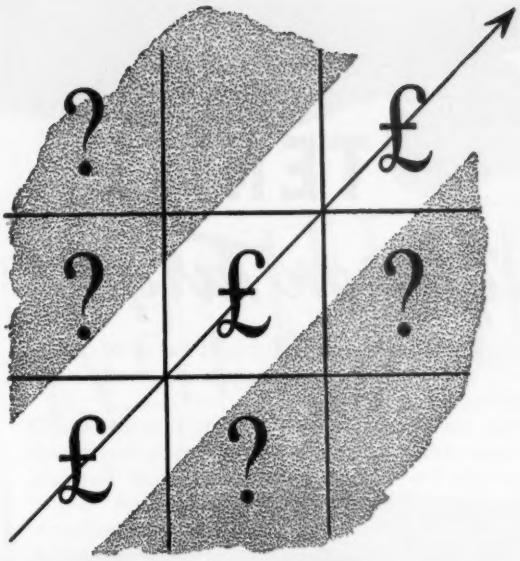
YOU GET MILES MORE QUALITY PRODUCTION WITH BOSTON — EVERY FOOT PERFECT AND SALEABLE

Consult us for your special-purpose requirements

Trade Enquiries Invited (Home and Overseas)

BOSTON MARINE & GENERAL ENGINEERING CO LTD

VICEROY WORKS, LOW FIELDS RD., LEEDS, 12, ENGLAND. Tel : Leeds 34261/2/3. Telegrams: Bosmarco, Leeds, 12



Turn problems into profits

with PLASTICS

As competition grows keener, more and more manufacturers are turning to Kent Mouldings for the means to keep ahead. A more attractive product . . . simplified assembly . . . substantial reductions in time, labour and production costs—these are typical of the advantages of Plastics Mouldings.

Kent Mouldings specialise in mouldings for electrical, radio and television equipment, telecommunications, computers, toys, bobbins for textiles and a thousand other products.

Next to quality, we pride ourselves on first class service and highly competitive prices.

Perhaps we can help you to improve your product or overcome a production problem. If the job can be done with plastics, you'll get better results from. . . .

NYLON
P.T.F.E.
UREA RESIN
MELAMINE RESIN
P.T.F.C.E.
P.V.C.
POLYTHENE
CELLULOSE ACETATE
DIAKON
PHENOLIC RESIN
POLYSTYRENE
ALKYD RESIN

for mouldings that matter

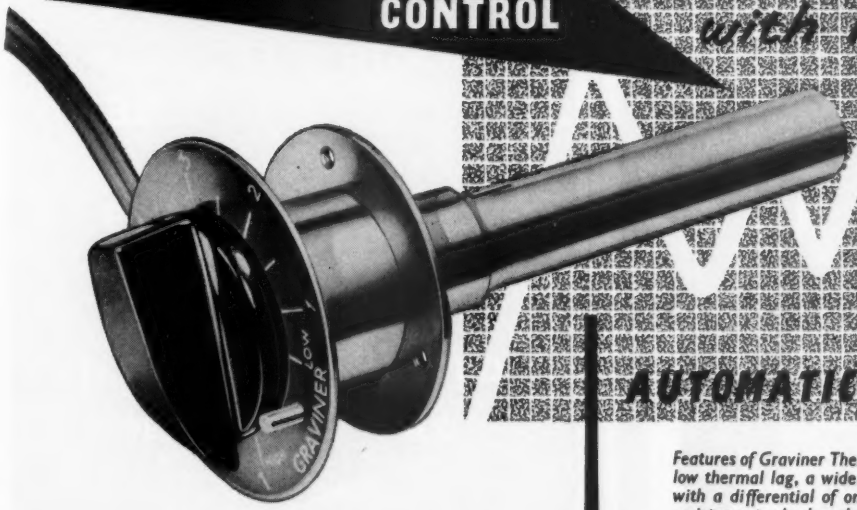
KM KENT MOULDINGS

FOOTSCRAY . SIDCUP KENT

Tel.: Footscray 3333

TEMPERATURE CONTROL

with PIN-POINT



AUTOMATIC ACCURACY

Features of Graviner Thermostats and Overheat Switches include a low thermal lag, a wide range of adjustment (–70°C to + 320°C) with a differential of only 0.5°C. Simple installation with high resistance to shock and vibration.

GRAVINER

THERMOSTATS AND OVERHEAT SWITCHES

Further information and technical details may be obtained from:—

GRAVINER, COLNBROOK, BUCKS.

Telephone: COLNBROOK 2345

Also Specialists in
Airborne Fire Protection and Industrial Explosion Protection

Dart manufactured by the Dorwin Pencil Company Limited. The flight holder is of transparent 'Tenite' Butyrate with wording placed inside

TENITE..
right on Target

A dart has to be tough yet light. It has to be dimensionally stable and it has to be pleasant to the touch and attractive to look at.

When the Dorwin Pencil Company Limited decided to produce a dart, experience proved that the best moulding powder for the flight holder was 'Tenite' Butyrate, the plastic material which has all these qualities. 'Tenite' Butyrate, with 40,000 colours and an infinite number of uses, has solved a great many moulding problems. Perhaps it can solve yours. Why not write and enquire now?

Kodak Limited, Special Chemicals and Plastics Sales Division
1-4 Beech Street, London, E.C.1. *Telephone:* Metropolitan 0316

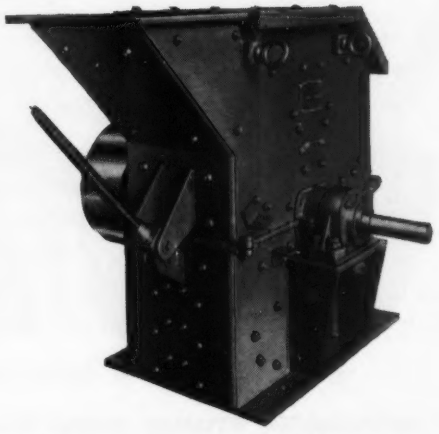
'Tenite' is a registered trade-mark.

AERASPRAY

Application of Polyester and Epoxy Resins and similar fluids by the Aeraspray model GTH.10 Catalyst Spray Gun gives greatly reduced production costs. 'Pot Life' and premature gelling are eliminated by keeping catalyst and resin apart until application takes place. Tests carried out by large resin manufacturers and users prove evenness of gell coupled with high speed application.

AERASPRAY ASSOC. LTD. *Makers of Air Compressors, etc.*
Head Works, Nechells, Birmingham, 7. *Phones: EASt 1671-4, etc.*

HAVE YOU A CRUSHING PROBLEM IN DEALING WITH PLASTICS



If so, consult us without obligation.
We have had over 50 years' experience in the whole field of crushing.

Obtain our Booklet.

THE PATENT LIGHTNING CRUSHER CO., LTD.
14A, ROSEBERY AVE., LONDON, E.C.1.
Phone: Terminus 1928.

KENURE

For all thermoplastic moulding and extrusion

J. F. KENURE LIMITED

FELTHAM, MIDDLESEX

Telephone
FELTHAM 2604/5/6

Stabilisers for P.V.C.

White Lead* is still the cheapest and most widely used

*(*prepared by our special process)*

Other pigmenting types

Dibasic Lead Phosphite
Excellent Heat and Light stabiliser

Tribasic Lead Sulphate
A special Dielectric Heat stabiliser

Transparent and Translucent Types

Lead Silicate
Metallic Stearates
(Barium, Cadmium, Calcium, Lead, Triklar*).

*For efficiency and hygiene White Lead and Triklar are supplied only as dispersed pastes. Other products supplied dry or dispersed in plasticiser at buyer's option.

ASSOCIATED LEAD
MANUFACTURERS LIMITED

SPECIAL CHEMICALS DIVISION, CRESCENT HOUSE, NEWCASTLE UPON TYNE, 1

N

Announcing . . .

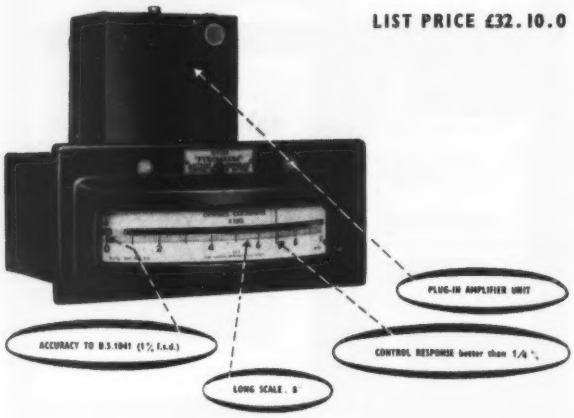
the

new

PYROMAXIM

electronic controller

LIST PRICE £32.10.0



- RUGGEDLY CONSTRUCTED
- INSTANTANEOUS CONTROL OPERATION
- MINIMUM PANEL SPACE
- ON/OFF INDICATING LIGHTS
- CALIBRATED FOR ANY STANDARD THERMO-COUPLE

Thirty-five years experience in the manufacture of fine electrical instruments are behind the Sifam Pyromaxim Electronic Controller.

Produced specifically to meet the demand for an economically priced instrument capable of working to high standards of accuracy, this new Controller combines sound design and well-proved construction principles with complete reliability.

Adequate Service arrangements are in operation at selected centres.

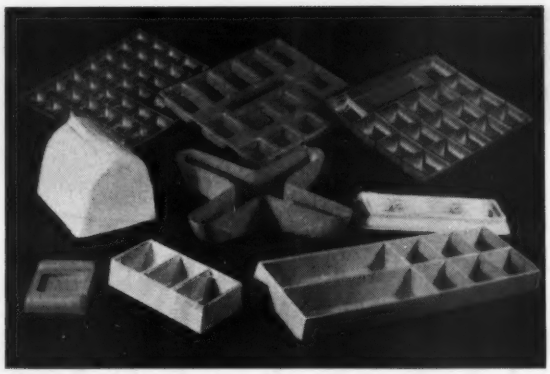
SIFAM

Write for Folder describing this new instrument in detail.

SIFAM ELECTRICAL INSTRUMENT CO. LTD.

Torquay, Devon, England

Telephone: Torquay 4547. *Telegrams & Cables: Sifam, Torquay.*



Vacuum Forming . . .

If you will let us have any plastic fabricating problems you need resolving we shall be very pleased to offer our expert advice

Vacuum Forming is another service offered by Tensile Products Ltd., in addition to General Plastics Fabrication. With this process an infinite variety of shapes can be produced economically in High Impact Polystyrene, Cellulose Acetate, etc., for such purposes as Packaging, Display, Signs, Interior Fittings for Cabinets, etc.

TENSILE PRODUCTS LTD.

WILLOUGHBY RD., HARPENDEN, HERTS. TEL. HARPENDEN 300 & 311

HARD CHROME PLATING

- Mirror finish on Dies, Moulds, and Tools for Plastic and Rubber Industries
- For Wear and Reclamation on Worn Machine Parts and Machine Tools
- **General Metal Workers, and Engineers**
- Trade Electro-Platers and Enamellers for all Metal Finishes
- Guaranteed Quality Work
- Collection London District

THE ISLINGTON

METAL & PLATING WORKS LTD.

TORRENS WORKS

TORRENS ST. (ANGEL) LONDON, E.C.1

TELEPHONE: TERMINUS 9621 (5 LINES)

A.I.D., A.R.B. & A.R.D.E. APPROVED

HEAVY CHROME DEPOSITIONS

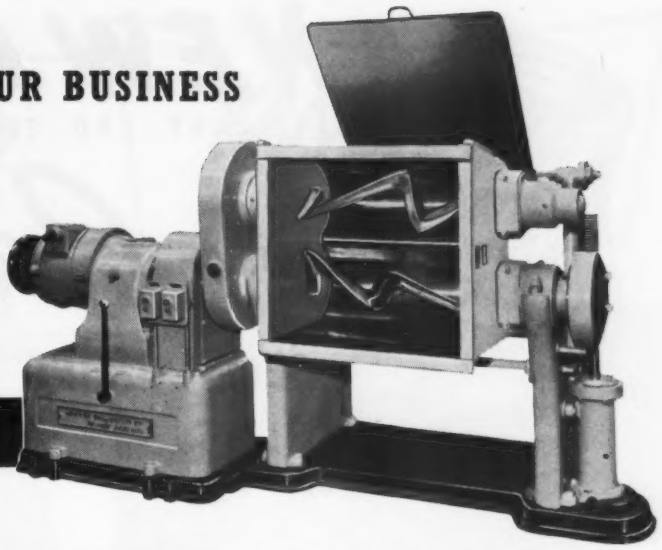
MIXING IS OUR BUSINESS

★ Morton Duplex Mixers are serving the Plastic (Chemical) Industry without fuss or bother day in and day out.

★ Our Experience of 99 years in mixing technique is at your disposal.

★ Technical Representatives throughout the Country. Consult us if you have a problem.

MORTON DUPLEX MIXERS



MORTON

A HEENAN GROUP COMPANY

★ MIXING POWDERS?
★ MIXING GRANULES?
★ MIXING FIBRES?
★ MIXING PASTES?
★ MIXING DOUGHS?

SIZE 4½ "Duplex" MIXER
Capacity 9 Cubic Feet.

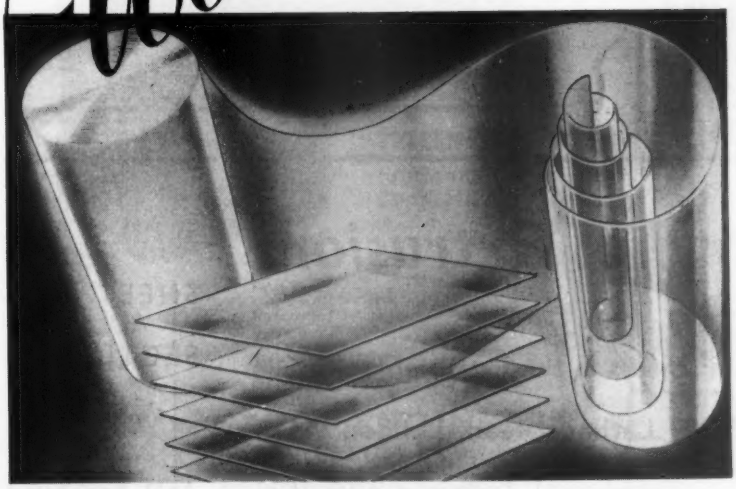
FEATURES CAN INCLUDE: Hydraulic tilt, heating, cooling, or Vacuum of Box while mixing. Heavy duty models. Special Beaters. Stainless steel and other materials of construction. Laboratory models.

MORTON MACHINE COMPANY LTD WISHAW · SCOTLAND *Telephone: Wishaw 700*

(1933-1958)

Utilex

CELLULOSE ACETATE
sheets and films
SUITABLE FOR VACUUM FORMING



CLEAR TRANSPARENT
pol/pol or matt/pol

COLOURED TRANSPARENT
tinted

LAMPSHADE MATERIAL
matt or embossed

COLOURED OPAQUE
pol/pol or matt/pol

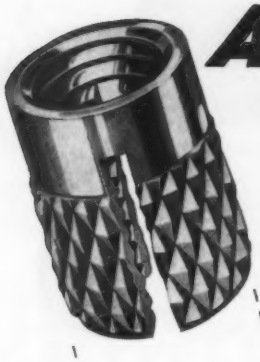
METALLISED
mirror-finished in silver and colours

INSULATING
dielectric qualities

UTILEX LIMITED *MILL STREET, KINGSTON-ON-THAMES. Telephone: KINGSTON 1660*

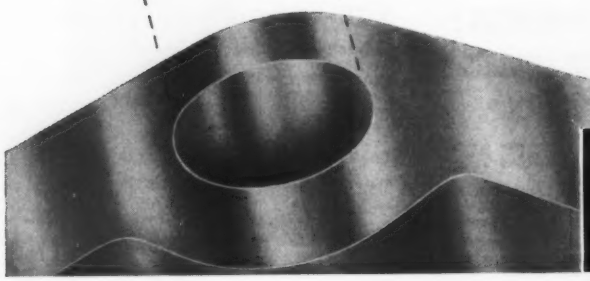
A NEW IDEA!

FAST, EASY AND ECONOMICAL TO USE



PRECISION **Banc-Lok** SELF-LOCKING **INSERTS**

THE INSERT THAT IS PUSHED IN *AFTER* MOULDING



★ PROVIDE RE-USEABLE SELF-LOCKING THREADS IN BLIND HOLES

★ NO SPECIAL TOOLS NECESSARY.. JUST PRESS INTO ROUND HOLES

Types supplied for plastic, wood and other compositions

Write for Leaflet No. 200

THE PRECISION SCREW & MFG Co. Ltd.

UNION STREET · WILLENHALL · STAFFS

TELEPHONE: WILLENHALL 621 & 622

Wanted STOCKS for CASH

We are cash buyers of merchandise of every description. Also Clearance Stocks. Discontinued Lines, Surplus and Redundant Stocks. Bottles, Jars, Screw Caps, Cartons, and other Packaging Materials. In fact, goods of all kinds can be disposed of through us without delay, on the most favourable terms, and without trouble.

Should you have anything for disposal either now or at any future time please send us samples, full particulars and price on a cash settlement basis and the matter will have our immediate and careful attention.

RELIANCE TRADING CO.

75, FAIRFAX ROAD, SWISS COTTAGE, LONDON, N.W.6
Phone: KILburn 0581 & 0038 *Grams:* "GORDON" KILBURN 0581

STELLA POLARIS

NATURAL PEARL ESSENCE

available in top quality grades—for best pearl effects

SUPER • STANDARD

Manufactured by :—

O. NILSSEN & SON A/S, BERGEN, NORWAY

Agents :—**THOMSON & JOSEPH LTD.**
37 MANCHESTER STREET, LONDON, W.1
FOR UNITED KINGDOM, EIRE & SOUTH AFRICA

ROBERT BRYCE & CO., LTD.
738/741 SALISBURY HOUSE, LONDON WALL, E.C.2
FOR AUSTRALIA & NEW ZEALAND

"Evolite" *Acrylic Extrusions*

TUBES
SHEET
SECTIONS

Consult the Pioneers in the Extrusion of Acrylic

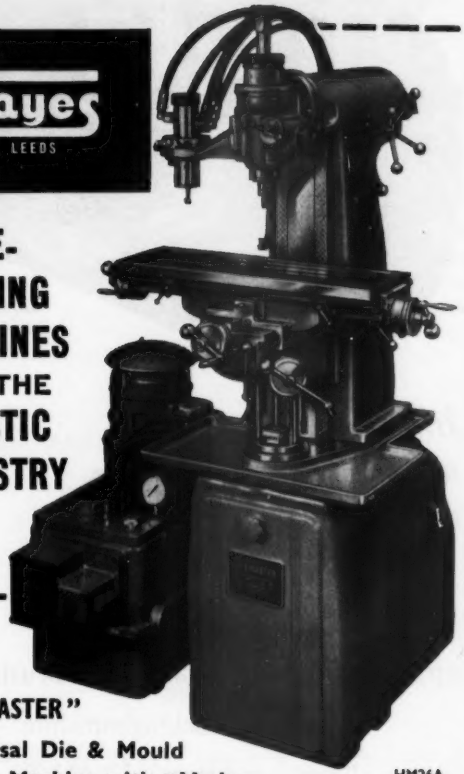
Richard Daleman Limited, 325-327 Latimer Road, London W.10

Telephone : Ladbroke 3709/1879

AID Approved

Hayes LEEDS

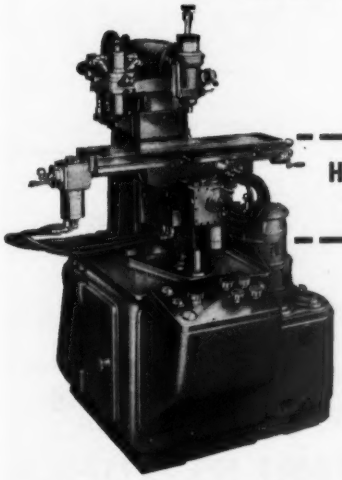
DIE-SINKING MACHINES FOR THE PLASTIC INDUSTRY



"DIEMASTER"

Universal Die & Mould Milling Machine with "Hydro-tracer" Copying attachment

	HMH21A Standard Machine	HM26A with Hydro-tracer
Table Size	21" x 6½"	26" x 8½"
Longitudinal Traverse ...	12"	13"
Transverse Traverse ...	5"	5"
Vertical Traverse ...	12"	12"
Overarm Traverse ...	7"	7"
Working Area	10½" x 12"	10½" x 13"
Spindle Speeds	50-2, 400 r.p.m.	



HIGH-SPEED HEADS

1,000 — 6,000 R.P.M.

"TRACEMASTER"

Automatic Copy Milling

	TM32a
Table Size	32" x 8½"
Longitudinal Traverse ...	16"
Transverse Traverse	8"
Overarm Traverse	7"
Working Area	11" x 16"
Vertical Hand Traverse ...	9½"
Vertical Hydraulic Traverse ...	3½"
Spindle Speeds ...	50-2, 400 r.p.m.

Sole Selling Agents for Home and Overseas :

ASSOCIATED BRITISH MACHINE TOOL MAKERS LTD.

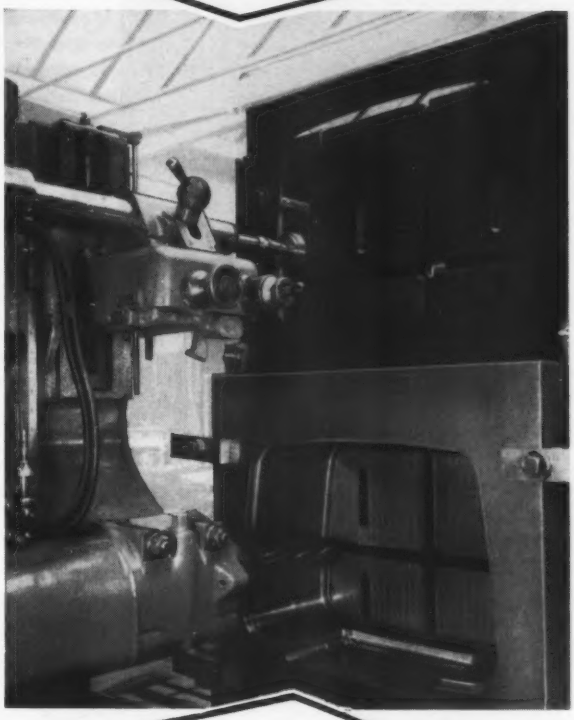
17 Grosvenor Gardens, London, S.W.1

HAYES ENGINEERS (LEEDS) LTD.

GELDERD ROAD, LEEDS 12.

Tel.: 30941. 'Grams.: "Toolmaker" Leeds 12.

Pioneers



IN MOULDS FOR MODERN PLASTICS

ALSO . . .

JIGS AND GAUGES

GAUGE & TOOL MAKERS ASSOCIATION

BARBER & DUFFY LTD

214/222 CARDIGAN ROAD, LEEDS

'PHONE : LEEDS 52033

For economical cutting of plastics without chipping...

Type PP-O, 6 in. diameter, .080 in. cutting width, 48 teeth.

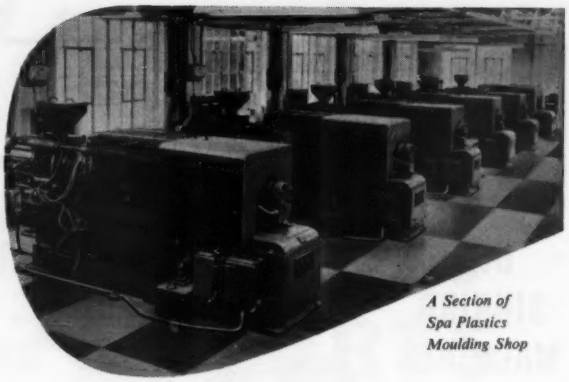
Ask for our 16-page booklet showing 20 further types of GOMEX carbide tipped circular sawblades.

U.K. Distribution and Service

JACK MIDHAGE & CO. LTD.

41 · CITY ROAD · LONDON · E.C.1

Telephone CLE. 7928/8679



A Section of Spa Plastics Moulding Shop

Injection Moulders

to Customers Specifications up to 32 ozs.

Enquiries Invited

Technical Advice Service Available

SPA PLASTICS (Division of Spa Brushes Ltd.)

Chesham, Buckinghamshire.

Telephone: Chesham 371 (P.B.X.)

MICHAEL S. STEVENS Ltd.

PLASTIC SCRAP

Buyers & Sellers, Exporters & Importers.

Head Office: 50, Ravenscourt Gardens, Hammersmith, W.6.

Riverside 8906-8

M.C.M.

(TOOLS) LTD.

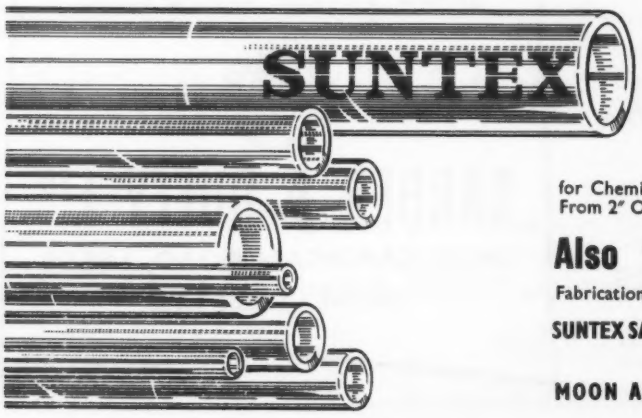
Designers and Toolmakers

for Compression, Transfer and Injection Moulds, Pressure Die Casting Tools, Jigs and Fixtures

Let us solve your difficulties

M.C.M. (Tools) LTD. BIRMINGHAM, 22C.

715 Kings Road, Kingstanding *Great Barr 1112/3*



CAST ACRYLIC TRANSPARENT TUBES

SUNTEX

(by I.C.I. process)

for Chemical and Industrial applications or where clear vision is essential. From 2" O.D. to 6" O.D. in various wall thicknessses.

Also "PERSPEX" AND RIGID P.V.C.

Fabrications and Mouldings—Pressed or Vacuum Formed by Specialists.

SUNTEX SAFETY GLASS INDUSTRIES LTD., Thorney Lane, Iver, Bucks.

Telephones: Uxbridge 4970 and Iver 11/12.

MOON AIRCRAFT LTD., BOX, WILTS. Telephone: Box 488.

LARGE CAPACITY VACUUM COATING

with the NEW VIA-VAC *EH 60*

Rapidly expanding industrial application of the vacuum evaporation process requires plant with a large loading capacity and fast pumping cycle, combined with simplicity in operation and easy maintenance. The VIA-VAC EH 60 Vacuum Evaporator with a 60 in. i.d. chamber is standard equipment of this kind which enables a great number and variety of sizes of articles to be accommodated on suitable jigs. The 60 in. i.d. shown is of stainless steel with mild steel outer covering. The plant is designed to occupy the minimum of floor area; the movement of the door does not require additional useful shop space, and the pumps are accessible from all sides. The diffusion pumps are secured by quick-action toggle or cam clamps for ease of servicing. Illustrated technical booklet is available on request.

HIGH VACUUM CONSULTING
VIA-VAC
SERVICE TO INDUSTRY

VACUUM INDUSTRIAL APPLICATIONS LTD (Dept. P) · WISHAW · LANARKSHIRE · SCOTLAND
Telephone : WISHAW 142 *Telegrams :* VIA-VAC WISHAW

'HARCO'

PERFORATED METAL

Accurately perforated and extremely durable, 'Harco' Perforated Metal is produced in most metals for any grading, screening or sorting requirement. A wide range of plain, embossed and ornamental patterns is available.

Send for Catalogue No. PS 926.

Harvey

Telephone: GREenwich 3232 (22 lines)
G. A. HARVEY & CO. (LONDON) LTD., Woolwich Road, London, S.E.7

DRM

DURHAM CHEMICALS PRODUCED AT BIRTLEY, COUNTY DURHAM

P.V.C. STABILISERS

Metal Stearates, Laurates, Ricinoleates, Lead Silicate

BRANCH OFFICES:

31 King St. West, MANCHESTER 3
Deansgate 5581

Birtley, COUNTY DURHAM
Birtley 240

180 Hope Street, GLASGOW C2
Douglas 2561

HEAD OFFICE:

DURHAM RAW MATERIALS LTD.
1/4 GT. TOWER ST., LONDON, E.C.3
MANsion House 4333

HELI-COIL
REGISTERED TRADE MARK

PUSH-TYPE INSERTS

THE READY-MADE THREAD FOR MOULDED MATERIALS

Eliminate the need for solid bushings and tapping, use HELI-COIL PUSH-TYPE INSERT the ready-made screw thread for moulded and plastic parts, die cast alloys, powdered metals, all soft light materials and many hard metals. Pushed directly in drilled cast, or moulded, blind or through holes, this is the ideal low-cost, volume production, fastening method. A few shillings in tooling is all you need for up to 1,200 holes and more per hour.

For faster, cheaper production

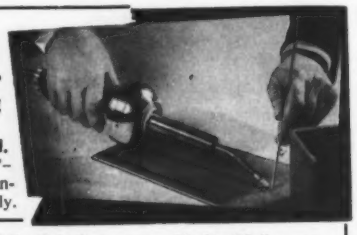
Write for details to:
ARMSTRONG PATENTS CO. LTD., BEVERLEY, YORKS.

BAP 9

NEW— HANDY . . .

LK Plastic Welding Tools

No compressor required. Hot airstream, 180°–500° C., simply by connecting to mains supply.



For hard and soft P.V.C., Polythene etc. Under 2½ lbs, can be carried in a briefcase. Also available : LP Welding Pistol, 12½ ounces only, Chamfering & Cutting Tools and Feedrollers.

Apply Catalogue P3

WELWYN TOOL COMPANY LIMITED,

Stonehills House, Welwyn Garden City, Herts. Tel. Welwyn Garden 5403.

—MODELS—

We are specialists in Product Design and Model making for the Plastics Industry. In this now accepted technique for conveying ideas from the 'Seed,' through Design and Sales 'Approval' to the Mould-Maker, our Models have proved invaluable at every stage—with our Design Capacity offering supporting facilities.

CONSULT US ON YOUR NEXT PROPOSED PROJECT

R. J. EMERY & Co.
WELWYN GARDEN CITY
Telephone: Welwyn Garden 4720

LY-BAK LIMITED

RUBBER & PLASTICS MANUFACTURERS

THERMOPLASTICS

Cellulose Acetate . Polythene . Polystyrene . Aceto-Butyrate P.V.C. and Co-polymer compounds . Polystyrene/Rubber compounds . "Semlux" Fibreglass products . "Plastiblox" Clicker and Rev Press Boards.

SOUTHERN INDUSTRIES AGENCY
(LONDON SALES OFFICE FOR THE GROUP)

SUITE 52 : 26, CHARING CROSS ROAD
LONDON, W.C.2. Telephone: Covent Garden 2538
" " " 1884

Virgin high acetyl and standard, cellulose acetate moulding powders. We are able to reprocess your redundant stocks and scrap into first-class moulding powders. We would be pleased to make you an offer for your scrap. Prompt deliveries of virgin and reconstituted powders.

LET US SOLVE YOUR MATERIAL PROBLEMS—THERMOPLASTICS IS OUR BUSINESS

"LY-BAK PRODUCTS ARE GUARANTEED TO SATISFY"

SAMPLES AND SERVICE AVAILABLE UPON YOUR INSTRUCTION

PROGRESS IN PLASTICS

VACUUM FORMING
FABRICATING

DISPLAYS
SHOWCARDS

PRINTING

Craftsmen in all Thermoplastic Sheeting
for over 30 Years

CELLGRAVE
COMPANY LIMITED

ALPHA HOUSE · CHOUMERT ROAD · LONDON · S·E·15
NEW CROSS · 0328-9

Have you a TUBE PROBLEM?

—if so, let us solve it

As a user of tubes—metal or otherwise—just consider whether or not a PAPER tube will do the job. Our paper tubes, **made of special quality paper, are impregnated with Thermo-hardening resins.** Strong, light in weight, they show a definite economy in cost. Used increasingly with every satisfaction in many industries. It will pay you to investigate this. Write to:

THE TEXTILE PAPER TUBE CO. LIMITED
OAKWOOD MILLS · ROMILEY · NR. STOCKPORT
Telephone: Woodley 2271-4

ACCURATE PRESELECTION

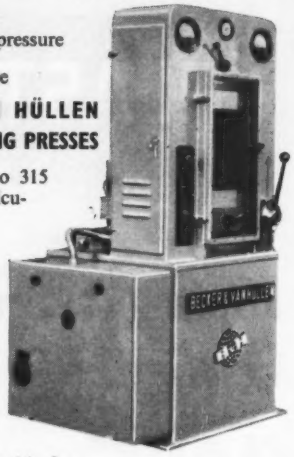
OF

ram speed
operating pressure
cycle time
temperature

BECKER & VAN HÜLLEN
TYPE P. MOULDING PRESSES

(ranging from 10 to 315 tons pressure). Particularly suited to plastics that are sensible to temperature, time and pressure.

TYPE P.10
10-ton down-stroking frame press.



Details of these and other Becker & Van Hüllen presses obtainable from

Sole Agents in Great Britain

ARPAL

ARPAL (ENGINEERS) LTD.

ABFORD HOUSE, WILTON ROAD, LONDON, S.W.1

Telephone: VICtoria 2785, 0783, 4880

BECKER & VAN HÜLLEN / KREFELD WEST GERMANY

FULL STEAM IN 5 MINUTES

SIMPLY SHUT-OFF WHEN STEAM IS NOT REQUIRED

- **Fully automatic**
  No attendant required
- **No boilerhouse**
  No chimney. No fuel store
- **No fire risk. Will go beside machines using steam**

B & A Electrode Boilers have been used in British Industry for over 25 years. They are more convenient, more compact than any other steam raisers. Users say "The saving of space in our plastics factory is considerable." "Steam pressure keeps more constant than any other type of boiler." *Write for Catalogue 1.F.*

B & A
ELECTRODE BOILERS

We also make the "SPEEDYJET", the only mobile cleaner that can be used indoors with No flame, No fumes. Just plug in and one man does the work of five — with high velocity steam and detergent. *Write for Catalogue 5.F.*

BASTIAN & ALLEN LTD., FERNDALE TERRACE, HARROW, MIDDLESEX

BA39

INJECTION MOULDINGS

UP TO 12 OZS. CAPACITY IN

- DIAKON
- POLYTHENE
- POLYSTYRENE
- NYLON and P.V.C.

- 3-D MOULDINGS and NAME PLATES
- MACHINED PARTS IN PLASTICS and METALS
- PLASTIC COVERING
- WE OFFER OUR 30 YEARS' EXPERIENCE TO YOUR NEEDS

Ketch PLASTICS LICHFIELD

Contractors to H.M. Government

Telephone: LICHFIELD 3591–2

PLASTICS

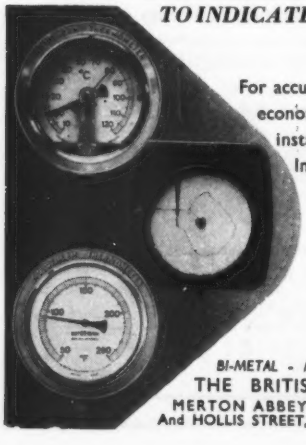
POLYTHENE, Polystyrene, Acetate and Perspex. We are sellers and buyers of these materials in any form.

GRANULATION and reprocessing plant available for:— Nylon, Cellulose Acetate, Polystyrene, Polythene and other Thermoplastic scrap. Materials ground to customers' requirements.

All enquiries to:—

John Castle & Co. Ltd.

5 HURLEY RD., LONDON, S.E.11
Phone: RELiance 4274/5



TO INDICATE, CONTROL OR RECORD

TEMPERATURE

For accuracy, ease of reading, robustness, economy and long trouble free life install Rototherm Thermometers. Instruments are available to suit most Industrial and Laboratory requirements. Specialists in bi-metallic applications.

Please write for details

Rototherm

BI-METAL - MERCURY-IN-STEEL - VAPOUR PRESSURE

THE BRITISH ROTOTHERM CO. LTD.

MERTON ABBEY, LONDON, S.W.19 LIBerty 7661
And HOLLIS STREET, NEW BASFORD Nottingham 77847

W. B. COLDWELL & SONS LTD.

DIESINKERS, MOULDS, JIGS.

89-91, ROCKINGHAM LANE,

SHEFFIELD, 1.

TELEPHONE: SHEFFIELD 24047.

DIPLOMA FOR DIE SINKING 1911

PLASTIC COATING

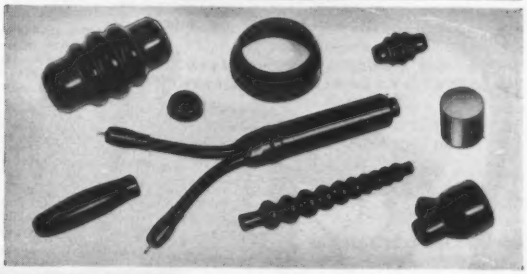
P.T.F.E. — NYLON — P.T.F.C.E.
POLYTHENE and P.V.C.

Spraying and Dipping in quantity, to give Corrosion-proof, insulation and non-stick coatings, to Castings, Vats, Tubing, Wirework, Handwheels, Handrails, Moulds, etc., etc.

Collections throughout Southern England

Call, write or 'phone.

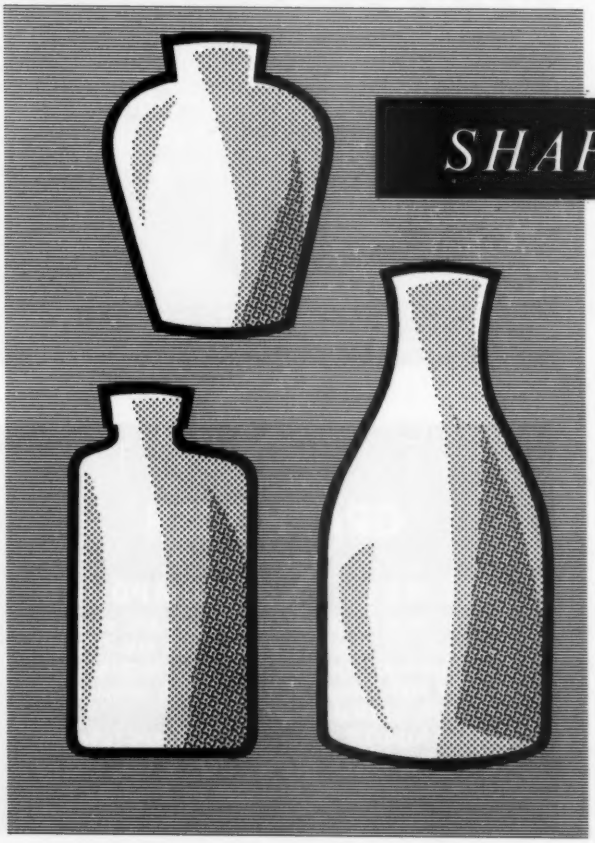
P.T.F.E. coated mould to give non-stick surface to rubbers and epoxides.



P.V.C. dip mouldings and castings for intricate flexible shapes, at low tool and item cost.

DURABLE PLASTICS LIMITED

WOODBRIDGE
INDUSTRIAL ESTATE
By Pass · Guildford · Surrey
Telephone: GUILDFORD 5228/9



SHAPELY PRINTING

DUBUIT

with Dubuit Silk Screen Printing Machinery
Hand Operated and Automatic Machines for Printing on objects of all shapes made from Plastic materials.
Manufacturers of screens, special inks, and silk screen printing accessories.

Dubuit Limited

Technical Advisory Services,
Showrooms and Offices at:—
8 Chase Road, Park Royal, London, N.W.10.
Elgar 7695/6 and 2685.

ACCURATE PRESELECTION

OF
ram speed
operating pressure
cycle time
temperature

BECKER & VAN HÜLLEN
TYPE P. MOULDING PRESSES

(ranging from 10 to 315 tons pressure). Particularly suited to plastics that are sensible to temperature, time and pressure.

TYPE P.10
10-ton down-stroking frame press.

Details of these and other Becker & Van Hüllen presses obtainable from

Sole Agents in Great Britain

ARPAL

ARPAL (ENGINEERS) LTD.
ABFORD HOUSE, WILTON ROAD, LONDON, S.W.1
Telephone: VICtoria 2785, 0783, 4880

BECKER & VAN HÜLLEN / KREFELD WEST GERMANY

FULL STEAM IN 5 MINUTES

SIMPLY SHUT-OFF WHEN STEAM IS NOT REQUIRED

- **Fully automatic**
  No attendant required
- **No boilerhouse**
  No chimney. No fuel store
- **No fire risk. Will go beside machines using steam**

B & A Electrode Boilers have been used in British Industry for over 25 years. They are more convenient, more compact than any other steam raisers. Users say "The saving of space in our plastics factory is considerable." "Steam pressure keeps more constant than any other type of boiler." *Write for Catalogue I.F.*

B & A
ELECTRODE BOILERS

We also make the "SPEEDYJET", the only mobile cleaner that can be used indoors with No flame, No fumes. Just plug in and one man does the work of five — with high velocity steam and detergent. *Write for Catalogue S.F.*

BASTIAN & ALLEN LTD., FERNDALE TERRACE, HARROW, MIDDLESEX

BA39

INJECTION MOULDINGS

UP TO 12 OZS. CAPACITY IN

- DIAKON
- POLYTHENE
- POLYSTYRENE
- NYLON and P.V.C.

- 3-D MOULDINGS and NAME PLATES
- MACHINED PARTS IN PLASTICS and METALS
- PLASTIC COVERING
- WE OFFER OUR 30 YEARS' EXPERIENCE TO YOUR NEEDS

Ketch PLASTICS LICHFIELD

Contractors to H.M. Government

Telephone: LICHFIELD 3591-2

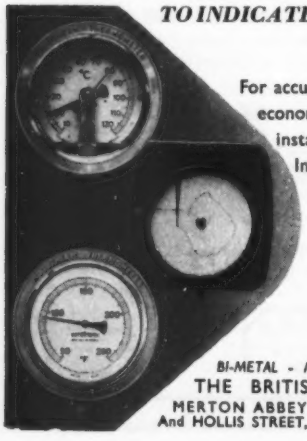
PLASTICS

POLYTHENE, Polystyrene, Acetate and Perspex. We are sellers and buyers of these materials in any form.
GRANULATION and reprocessing plant available for:— Nylon, Cellulose Acetate, Polystyrene, Polythene and other Thermoplastic scrap. Materials ground to customers' requirements.

All enquiries to:—

John Castle & Co. Ltd.

5 HURLEY RD., LONDON, S.E.11
Phone: RELiance 4274/5



TO INDICATE, CONTROL OR RECORD
TEMPERATURE

For accuracy, ease of reading, robustness, economy and long trouble free life install Rototherm Thermometers. Instruments are available to suit most Industrial and Laboratory requirements. Specialists in bi-metallic applications.

Please write for details

Rototherm

BI-METAL - MERCURY-IN-STEEL - VAPOUR PRESSURE
THE BRITISH ROTOTHERM CO. LTD.
MERTON ABBEY, LONDON, S.W.19 LIBerty 7661
And HOLLIS STREET, NEW BASFORD Nottingham 77847

W. B. COLDWELL & SONS LTD.

DIESINKERS,
MOULDS,
JIGS.

89-91, ROCKINGHAM LANE,
SHEFFIELD, 1.
TELEPHONE: SHEFFIELD 24047.

DIPLOMA FOR DIE SINKING 1911

PLASTIC COATING

P.T.F.E. — NYLON — P.T.F.C.E.
POLYTHENE and P.V.C.

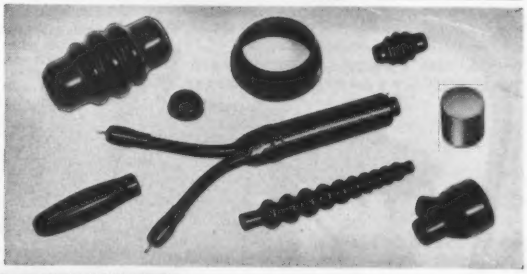
Spraying and Dipping in quantity, to give Corrosion-proof, insulation and non-stick coatings, to Castings, Vats, Tubing, Wirework, Handwheels, Handrails, Moulds, etc., etc.

Collections throughout Southern England

Call, write or 'phone.

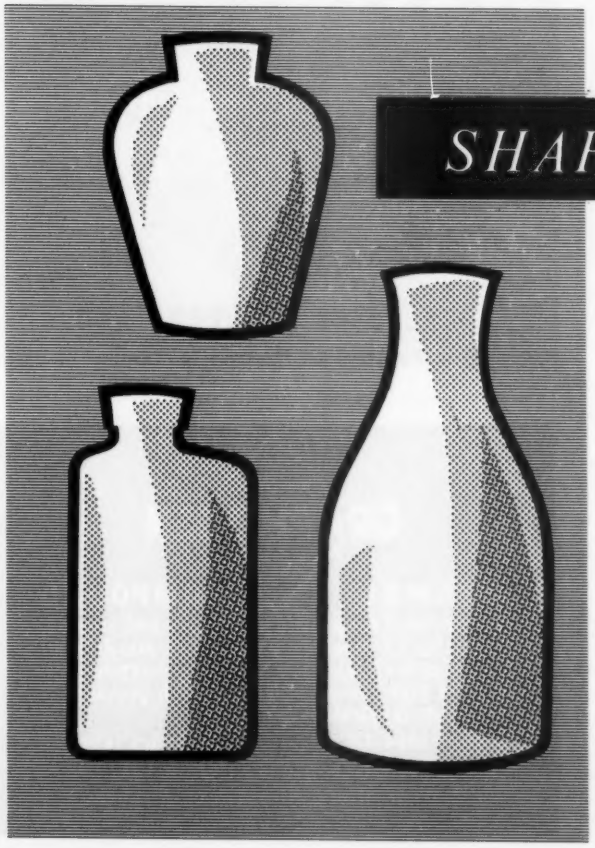
P.T.F.E. coated mould to give non-stick surface to rubbers and epoxides.

P.V.C. dip mouldings and castings for intricate flexible shapes, at low tool and item cost.



DURABLE PLASTICS LIMITED

WOODBRIDGE
INDUSTRIAL ESTATE
By Pass · Guildford · Surrey
Telephone: GUILDFORD 5228/9



SHAPELY PRINTING

DUBUIT

with Dubuit Silk Screen Printing Machinery
Hand Operated and Automatic Machines for Printing on objects of all shapes made from Plastic materials.
Manufacturers of screens, special inks, and silk screen printing accessories.

Dubuit Limited

Technical Advisory Services,
Showrooms and Offices at:—
8 Chase Road, Park Royal, London, N.W.10.
Elgar 7695/6 and 2685.

We Buy and Sell all types of

PLASTIC SCRAP

We welcome enquiries to grind customers' own material

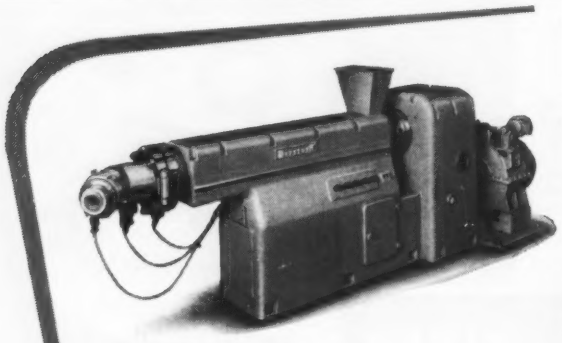
Acetate
Butyrate
Nylon
Polyethylene

J. W. NASH & CO., LTD.

27 BEETHOVEN STREET, LONDON, W.10

Telegrams: NASPEX, NOTTARCH, LONDON
Telephone: LADBROKE 4655-6-7

Acrylics
Celluloid
Polystyrene
P.V.C.



BERSTORFF

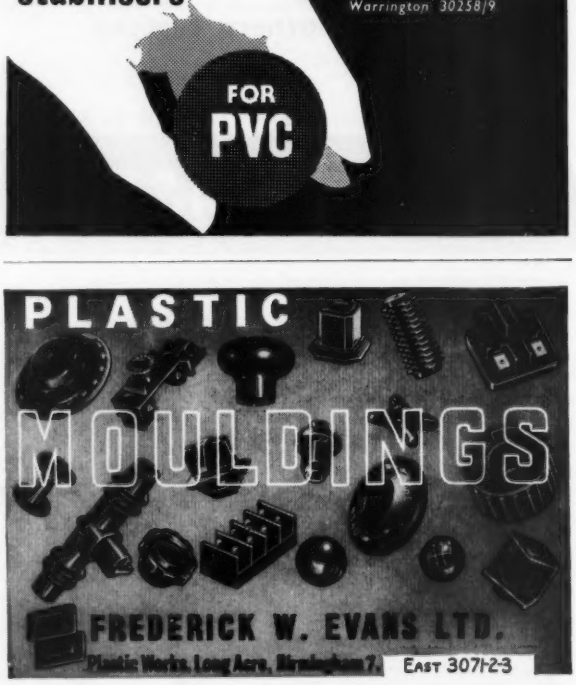
Plastics extruder with 120 mm. (4¾") diameter screw.
Electric heating with high precision control gear.
Water cooling, 5 separate zones or air cooling. Built-in reduction gear. Direct drive by variable speed motor or Beier infinitely variable gear.
Screws available for all types of plastics.
Complete auxiliary equipment for cables, rigid pipes, etc.
Other models from 1¼" to 8" screw diameter.
All types of calenders, mixing mills, extruders, continuous curing machines and auxiliary equipment for rubber and plastics.

INTERNATIONAL CORPORATION LTD

Manufactured by Hermann Berstorff, Hanover
International Corporation Ltd
1 Cornwall Rd · London S.E.1
Telephone : WATERLOO 3854

WHITE LEAD stabilisers FOR PVC

Consult
THE MERSEY WHITE LEAD CO. LTD.
Sankey Bridges, Warrington
Telephone:
Warrington 30258/9



PLASTIC SCRAP BUYERS

POLYTHENE
POLYSTYRENE
DIAKON, PVC.
ACETATE, PERSPEX IN LUMP, SCRAP, FILM
GROUND AND REGROUND FORMS

HERBERT CONNOR LTD.

Send Samples and Details: 120, Beaufort Park, London, N.W.11
HIGHEST PRICES PAID ON ANY TERMS
Telephone: Speedwell 5023

COLLOIDAL GRAPHOGEN GRAPHITE

ASSEMBLY COMPOUND

The lubricant for plastic machinery and moulds, especially for machine parts which are difficult to service e.g., injection moulding machines. In cases of high temperature and high pressure it retains its lubricating properties.

Medium tube 3/6 Standard tube 8/6

STAMGO MFG. CO. LTD.,
8 Wood Street, Kingston-on-Thames

Plastics Classified Advertisements

PRESS DAY.—Classified advertisements for the August issue must be received at Head Office by first post Monday, July 28.

Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—6d. per word (minimum 12 words 6/–). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 2 gns. per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/– to cover booking and postage, plus cost of four extra words. Box numbers must not be used for the purpose of circularizing and the proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM.—Facilities are available to readers to purchase advertised goods on approval by depositing the purchase price with "Plastics." Full details on application. Commission 1% (minimum 2/–) on amount deposited.

HEAD OFFICES.—Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, London Telex." Telex: 23839.

BRANCH OFFICES: Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Deansgate 6114–8. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

AUCTIONS

ESTABLISHED 1855.
EDWARD RUSHTON, SON AND KENYON,
INDUSTRIAL VALUERS, AUCTIONEERS AND
FIRE LOSS ASSESSORS.
12 YORK STREET,
MANCHESTER, 2.
Phone, Central 1937/8.
Grams, Russonken, Manchester. zzz-151

BUSINESS OFFICES AND PREMISES WANTED

MANUFACTURING COMPANY required engaged in any branch of the plastics industry, having tax loss of between £10,000 to £50,000. Box P503, care of "Plastics." 250-5

BUSINESS OPPORTUNITIES

PUBLIC COMPANY manufacturing compression and injection mouldings interested in purchasing company producing similar goods. Satisfactory profits essential. Continuity of present management preferred. Replies in strictest confidence to Box P484, care of "Plastics." 250-1332

AUSTRALIAN ADHESIVE MANUFACTURERS with Australia wide coverage, adequate manufacturing facilities and finance invite propositions for manufacturers of speciality adhesives suitable for various industries. No. 3213, care of Box 1627 G.P.O., Sydney, Australia. 250-20

SOUTH AFRICAN GROUP OF COMPANIES

WITH FIVE MANUFACTURING PLANTS AND SEVEN SALES OFFICES IN SOUTH AFRICA AND RHODESIA

seek new Products for local production and/or for Distribution or on Representation basis. Interested in Radio, all forms of Electronic Equipment and Components, Electrical Equipment and Components—Appliances, Lighting, Heating, Welding, Switching, etc.; Sheet Metal and Plastic Products.

Principals presently in U.K. Please contact promptly, care:
J. A. EWING & CO. (LONDON), LTD.
Shippers, attention: MR. E. MURRELL.
MONARCH 5081. 250-23

TECHNICAI EXECUTIVE (31), sound commercial administrative xperience and £5,000 capital, invites proposition fro.n company in the plastics or allied industry considering expansion, reorganization, or new product development. Box P5013, care of "Plastics." 250-x8724

PLASTIC MOULDER with toolroom facilities, desires co-operation with active distributing or wholesale organization with a view to manufacturing articles for their sole distribution. Write Box P501, care of "Plastics." 252-1393

CONSULTANTS

W. BRUCE BROWN, F.R.S.A., M.S.I.A., designer specializing in the development of new plastic articles. 140, Roding Rd., Loughton, Essex. Tel. Loughton 4138. 250-1338

THE BARON, COLEMORE DESIGN GROUP offer creative art styled industrial product and toy design. Inventive assemblies, modelling and master patterns for the plastic and allied industries. Let us handle all of your pre-tooling problems. 1 Little Marlborough St., London, W.1. Phone, REG 5811. 250-21

GLASS FIBRE KITS

AUTOPLAX Glass Fibre Experimental Kits containing glass fibre mat, woven glass cloth, polyester resin, catalyst, accelerator and full instructions for use. All items available separately ex-stock. Kits at 21s., 35s., 50s., £6 and £9 10s., post free, Automobile Plastics Co., Ltd., Autoplax House, 62–64 High St., Barnet, Hertfordshire. Barnet 9147. Telegrams: Autoplax-Barnet. zzz-167

MACHINERY, TOOLS AND PLANT

PLASTICS MACHINERY
Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.
Send your requirements to the specialists.
REED BROTHERS (ENGINEERING), LTD.,
REPLANT WORKS,
WOOLWICH INDUSTRIAL ESTATE, S.E.18.
Phone: Woolwich 7611. 250-13

HYDRAULIC. Frazer mono-radial pumps, new and secondhand, in stock. Thompson & Son (Millwall), Ltd., Cuba St., London, E.14. East 1844. zzz-158

Two only. 15-ton Vertical Injection Presses with push backs, less valves and guards. £75.
One only. 15-ton Thompson Upstroking Compression Press with gas platens, less valves and guards. £65.
One only. 10-ton Bradley & Turton Upstroking Compression Press with gas platens, less valves and guards. £40.
Two only. Gas Pre-heaters. £7 10s. 0d. each.
One only. 4,000-ton Hydraulic Press by John Shaw. £4,000.
Box P4226, care of "Plastics." 250-11

MIXERS AND BLENDERS. Usually a varied selection available for quick delivery. Enquiries welcome. Winkworth Machinery Ltd., 65 High St., Staines, Middlesex. 250-1115

TOOLMAKERS AND PRECISION ENGINEERS.
PLASTIC MOULDS—
Injection Moulds.
Compression Moulds.
Transfer Moulds.
Nylon Moulds.
SPECIAL PURPOSE MACHINES—
Prototype Machines.
Automation Machines.
DESIGN, DEVELOPMENT & MANUFACTURE—
Moulds.
Machines.
Jigs and Fixtures.
Press Tools.
Die Cast Tools.
W. E. CUCKSON & SON, LTD.,
FACTORY 7/F
TREFOREST INDUSTRIAL ESTATE,
PONTYPRIDD, GLAM.
Treforest 2038. 250-1335

INFRA-RED PANELS, new and used. Potterton Gas and Met. Vic. Electric. Apply Barnacle Ltd., Croydon. Phone, THOrnton Heath 1924. 251-1364

BRADLEY & TURTON 150 Ton Top and Double Side Ram Press for sale. Has been little used and is a type suitable for either metal powder pressing or for split plastic mouldings.

The unit is complete with control valves, pressure gauges, 7½ h.p. motor driven Towler Pump, switch gear for 3-phase 50 cycle 400/440 volt supply.

Included are all piping, couplings, interlock and operator guards.

Inspection by appointment, London area.
Box P499, care of "Plastics." 250-1368

Machinery Tools and Plant (contd.)

HUPFIELD GRANULATOR, motor drive, capacity 80 lb./hr. Box P508, care of "Plastics." 250-7

TWELVE HIGH FREQUENCY FUSING UNITS SUITABLE FOR WELDING P.V.C. IMPREGNATED FABRIC.
DUNLOP RUBBER CO., LTD.,
SPEKE, LIVERPOOL, 19.
Phone Hunts Cross 1850.
MR. GRAHL. 250-15

TENSOMETER HOUNSFIELD ACCESSORIES, including hardness tester, unused, cheap, for sale. Box P5010, care of "Plastics." 250-X7924

HYDRAULIC PRESSES

1,200-ton Upstroke Multi-Daylight, by Hugh Smith. Ram 39⅜ in. diameter × 24½ in. stroke. W.P. 1 ton/sq. in. Seven steel plates 5 ft. 2 in. × 4 ft. 1 in. Six daylights 8 in. each. C/W pumps and control gear.
750-ton Downstroke, by Francis Shaw. Ram 31 in. diameter × 48 in. stroke. W.P. 1 ton/sq. in. Tables 4 in. square. Daylight 6 ft. Complete with ejector rams operated by "Electraulic" Pump having 20 h.p. motor.
75-ton Down stroke, by Becker & Van Hullen, prefilling. Ram 8½ in. diameter × 23 in. stroke. W.P. 3,500 p.s.i. Tables 24 in. × 24 in. Daylight 30 in. Fitted ejector.
70-ton Downstroke, by Bradley & Turton, prefilling. Ram 10 in. diameter × 10 in. stroke. W.P. 1 ton/sq. in. Tables 17½ in. × 17 in. Daylight 20 in. Fitted ejector.
GEORGE COHEN, SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Phone Shepherds Bush 2070.
AND
STANNINGLEY, NR. LEEDS.
Phone Pudsey 2241. 250-29

OIL FIRING EQUIPMENT.
One set of oil firing equipment by Combustions Ltd., suitable for two Lancashire or Economic boilers. Capacity 8,000/10,000 lb. per hour each comprising: 2 pumping and heating units including steam oil heater, Weir fuel oil pump, hot and cold oil filters, burners, furnace closing plates and controls.
George Cohen, Sons, & Co., Ltd., Wood Lane, London, W.12. Phone, Shepherds Bush 2070, and Stanningley, Nr. Leeds. Phone, Pudsey 2241. 250-1365

MODERN ECONOMIC BOILERS

Edwin Danks Treble Pass Boiler, 10 ft. 6 in. diameter × 11 ft. 6 in. × 16 ft. 6 in., Evap. 11,620 lb./hr., 200 p.s.i., complete with Hopkinson Stoker.
Two John Thompson Treble Pass Boilers, 9 ft. 9 in. diameter × 14 ft. × 19 ft., Evap. 9,900 lb./hr., 120 p.s.i.
Rankin & Blackmore Double Pass Economic, 7 ft. 3 in. × 12 ft. × 14 ft. 6 in., Evap. 4,130 lb./hr., 250 p.s.i.
Hartley & Sugden Treble Pass, 7 ft. 6 in. diameter × 8 ft. 6 in. × 12 ft. 1 in., Evap. 3,420 lb./hr., 100 p.s.i.
Three Foster Yates & Thom. Economic Dry-back Boilers, 9 ft. 9 in. diameter × 15 ft. 6 in. long, W.P. 160 p.s.i., 10,000 lb./hr. from and at 212° F., with Hodgkinson Ram Stokers and all accessories.
Oil-firing equipment supplied if required.
GEORGE COHEN, SONS & CO., LTD.
WOOD LANE, LONDON, W.12.
Phone Shepherds Bush 2070.
AND
STANNINGLEY, NR. LEEDS.
Phone Pudsey 2241. 250-31

MACHINERY, TOOLS AND PLANT WANTED

EXTRUDER AND VACUUM FORMING MACHINES wanted. Send full details Box P4515, care of "Plastics." 250-1122

INJECTION MOULDING MACHINES required. Condition or size not important. Send details Box P497, care of "Plastics." 254-1367

WANTED by moulding company in South Wales, 3 oz., 4 oz. and 8 oz. Injection Moulding Machines. Inspect anywhere, please write Box P4914, care of "Plastics." 250-1369

COMPRESSION MOULDING PRESSES wanted 50-ton to 120-ton. Downstroke. By Bradley & Turton or Daniels. Details to Box P507, care of "Plastics." 250-1

DECKEL or similar three-dimensional Pantograph machine wanted. Box P506, care of "Plastics." 250-2

EDGWICK 1½-oz. type HY semi-automatic injection moulding machines. Box P502, care of "Plastics." 250-6

INJECTION MOULDING MACHINES required. 1-oz. to 12-oz. Also Masson cutter. Box P5011, care of "Plastics." 250-x7923

INJECTION MOULDING MACHINES wanted by Windsor 8, 16 and 32-oz. Details, price and location to Box P5015, care of "Plastics." 250-25

MISCELLANEOUS

CARDBOARD BOXES, also heavy and water-resisting containers. Rigid, folding, plain and printed. Charles Commissar Ltd. (Est. 1907), 12 Heneage St., London, E.1. Bishopsgate 6818. Noted for reliability. 252-1391

MOULDS

YOUR DESIGN
OUR DESIGN
MOULDS TO YOUR SATISFACTION
AND OURS.
PRECONOMY CO. LTD., TOOLMAKERS.
Eastfield side, Sutton-in-Ashfield, Notts. zzz-146

INJECTION AND COMPRESSION MOULDS. Designed and made by Anglo Cutting Tool Co., 117–119 Marlborough Road, Romford, Essex. Romford 3182. 250-x8723

COMPRESSION MOULDS FOR SALE. Production of Household Articles, Smokers' Sundries, Fancy Goods, etc. Box P495, care of "Plastics." 254-1366

INJECTION MOULDS.
COMPRESSION MOULDS.
TRANSFER MOULDS.
OUR DESIGN — YOUR DESIGN.
ENGRAVING. HEAT-TREATMENT.
ANY OR ALL SERVICES AVAILABLE.
LEIGH TOOL & GAUGE CO., LTD.
EMPIRE WORKS, CLEVELEYS, LANCS.
Established over 25 years. zzz-172

PRODUCTION CAPACITY AVAILABLE

INJECTION MOULDINGS by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 256-1120

NYLON, POLYSTYRENE AND ACETATE INJECTION MOULDINGS up to 2 oz. Reliable service. Latest-type machines. Keen co-operation on new lines. W. H. Adamson Plastics, Ltd., 39 Hedley St., Maidstone. 250-1121

VISIJAR LABORATORIES, LTD.
THE LEADING CRAFTSMEN IN
"PERSPEX."
PROTOTYPE AND REPETITION.
OFFICIAL I.C.I. STOCKISTS "PERSPEX."
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF "FORMICA."
149 LONDON ROAD, CROYDON, SURREY.
Phone, Croydon 8228 (two lines) zzz-133

SILICONE RUBBER MOULDING. Capacity available for prototype and repetition work. ESCO (Rubber) Ltd., 2 Stothard Place, Bishopsgate, London, E.C.2. zzz-164

EXPERIENCED FABRICATORS IN CORROSION RESISTING PLASTICS. Ducting, tank lining, pipe installations are speciality of A.C. Plastic Industries, 231 Old St., London, E.C.1. CLE 0231. 250-1112

INJECTION MOULDING CAPACITY. Considerable tool-cost savings based on 23 years' experience. Design advice. Martin's Products Ltd., 91–92 Turnmill St., E.C.1. CLErkenwell 6070. 250-1116

Production Capacity Available (contd.)

VACUUM FORMED PLASTICS. Design, printing and production capacity available. The Delta Plastics, Worcester Place, Oxford 57838. 250-1117

MOULDS, INJECTION, COMPRESSION AND TRANSFERS. DIESINKING, DESIGNS. Competitive prices. Russell Engineering Co., Ltd., Russell Rd., Croydon. Thornton Heath 4128. 222-175

GLASSFIBRE reinforced plastic mouldings by Payne & Payne Ltd., 6/10 Priory Mews, London, S.W.8. Own design and pattern making department. Expert laminating team. Phone Macaulay 7687. 252-1304

ALL TYPES INJECTION MOULDINGS, 2 oz., including tool manufacture and design service, under one roof. O.P.H. Ltd., Old Brickworks, Church Road, Harold Wood, Essex. Ingrebourne 41513. 222-179

INJECTION MOULDING, 3 oz. and 4 oz. Martin-Golod Ltd., Marbury Gardens, London, N.W.10. WILlesden 3888. 253-1334

ENQUIRIES
INVITED FOR
INJECTION MOULDINGS.
WESTMINSTER PLASTICS LTD.,
TEMPLE WORKS,
41 OLD CHURCH RD.,
CHINGFORD, E.4.
Phone Silverthorn 7927. 222-178

VACUUM-FORMED PLASTICS. "It's not cricket," but we delight in taking short runs, particularly in large moulding areas. B. T. Bennett & Co., 449 Alexandra Ave., Harrow. zzz-185

MOULDINGS IN ALL THERMOPLASTIC MATERIALS.

REPITITION MACHINING IN ALL MATERIALS.

RAPID, RELIABLE SERVICE AT LOW RATES.

BRISTOL REPETITION LTD.,

Plastics Division,

FEEDER RD., BRISTOL, 2.

A.I.D., A.R.B., etc., approved.

251-1392

SPA PLASTICS (Division of Spa Brushes Ltd.) Injection moulders to customers' specifications up to 32 oz. Enquiries invited. Technical Advice Service available. Freeman Works, Chesham, Bucks. Phone Chesham 371 (P.B.X.). zzz-190

RAW MATERIAL

CUEX LTD., can offer all at prices well below current list:—
Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex Ltd., 270 Corporation St., Birmingham. Central 5474. 250-10

BLACK POLYTHENE GRANULES. Large supplies always available at 1s. 9d. per lb. Box P472, care of "Plastics." zzz-177

PLASTIC DISCS.
EX BUTTON BLANKS.
Enormous quantities in all sizes and colours, cheap to clear. Write for stock lists and prices to :
DORMER PLASTICS LTD.
TRADING ESTATE, WEST HARTLEPOOL.

250-8

POLYTHENE TAPE. Natural or ivory. Continuous length reels, ¼ in. to 3½ in. wide, 0.010 in. to .060 in. thick. Box P482, care of "Plastics." 250-1333

PLASTICS (MANCHESTER), LIMITED,
BRITAIN'S LEADING STOCKISTS
OF
PERSPEX SHEET, ROD, TUBE.
HANOVER MILLS,
BUXTON STREET,
LONDON ROAD,
MANCHESTER, 1.
Phone ARD. 4567 (5 lines). 250-309

Raw Material (contd.)

PLASFILA. New, White, Water Levigated, inert, Filler or Loader, for Rubber and Plastics. Increases strength, reduces costs. Henshaw & Co., 97 Clearmount Rd., Weymouth. 254-1362

RAW MATERIAL WANTED

HERBERT CONNOR LTD., Buyers of all Scrap. Top prices paid on any terms for Polythene, Polystyrene, Diakon, Perspex, P.V.C., Acetate, Nylon, in lump, scrap articles, ground and re-ground forms and film offcuts. Please send samples and details to: 120 Beaufort Park, London, N.W.11. 250-27

POLYETHYLENE MOULDING POWDERS, lay-flat tubing and scrap of all kinds wanted against prompt cash payment. Box P398, care of "Plastics." zzz-147

ALL GRADES of nylon scrap required. Box P408, care of "Plastics." 250-9

THERMOPLASTIC SCRAP. We always buy large and small quantities and pay prompt Cash. Send offers to J. W. Nash & Co. Ltd.. 27 Beethoven St., W.10. Ladbroke 4655/6/7. 250-12

POLYTHENE, P.V.C., PERSPEX, POLYSTYRENE, any quantity, urgently required. Multitex Ltd., 12 Penzance Place, Portland Rd., London, W.11. Phone Park 2611. zzz-184

WANTED all types of Polythene Scrap. Send details and samples to: Tyruplex Ltd., 111 High St., N.W.10. Elgar 2684. 250-14

WANTED, Polythene scrap. Write to Box P221, care of "Plastics." zzz-132

SPOT CASH BUYERS of all thermoplastic injection scrap and redundant virgin lots. Regular collections. WG Plastics, 14 Cambridge Park Mews, Twickenham, Middlesex. Popesgrove 1800. 258-1305

BROCKWELL PLASTICS LTD., 50 Hollingbourne Rd., S.E.24, will purchase redundant polyethylene scrap of all kinds. We collect and pay cash on collection. Box P399, care of "Plastics." zzz-148

POLYTHENE SCRAP. Top prices paid on any terms for any form of polythene scrap, i.e. extrusion lumps, scrap articles, film offcuts, ground and re-ground forms. Please send details and samples to: Herbert Connor Ltd., 120 Beaufort Park, London, N.W.11. 250-28

REFRIGERATION & AIR CONDITIONING PLANT

FRIGIDAIRE LOW TEMPERATURE REFRIGERATORS, 49 in. wide × 28 in. deep × 34 in. high. Ext. Ex large national user, suitable A.C. or D.C. deep freezing, storage of ice-cream, frozen foods, etc. Price £40 each. Domestic refrigerators, service cabinets, and cold rooms also available. A.R.C., 134 Great Portland St., London, W.1. MUSeum 4480. zzz-171

SITUATIONS VACANT

CHILTERN HUNT LTD. require Polythene Extrusion/Lamination Supervisor with thorough knowledge of machines and materials and proven ability to produce top quality products. This is an opportunity to join a leading company in the packaging field. Consideration would be given to training a man for this position providing he can show ability and the desire to make progress. All applications will be treated in the strictest confidence. Hemel Hempstead, Hertfordshire. 250-22

SALES MANAGER required by extrusion manufacturers. Fine prospects for young man with practical, technical experience in this field. Write giving full particulars to Box P5014, care of "Plastics." 250-24

CHILTERN HUNT LTD.
has a vacancy for a Sales Manager. Applicants should have experience in the packaging, paper or thermo-plastic industries, together with the ability to work on own initiative for the creation of sales and promoting advertising campaigns and able to extend existing market and develop new lines. A knowledge of polythene incorporating laminations, printing and engineering would be an advantage. Excellent opportunity for the right man in first-class company. Pension scheme. Write in first instance giving details of education, experience and salary to:
THE SECRETARY,
CHILTERN HUNT LTD.,
HEMEL HEMPSTEAD,
HERTFORDSHIRE. 250-18

CHEMIST required with specialized knowledge of synthetic rubbers, some knowledge of polyurethanes desirable. The post is a senior one carrying a high salary commensurate with high qualifications. Reply: Managing Director, Tenaplas, Upper Basildon, Berks. 250-1137

Situations Vacant (contd.)

WORKS MANAGERS

(BOTH TRAINEE AND EXPERIENCED)

required by a large Industrial Organization with Branches throughout the United Kingdom and abroad. Applicants should possess a fair experience in the production of plastic products and a knowledge of calendering, extruding and laminating would be helpful. They should also possess some engineering experience with ordinary National Certificate OR a sound knowledge of costing and experience in factory administration.

Applicants with junior management experience or who have held positions of similar capacity in the plastic industry, are invited to apply, and also those who have not yet had any managerial experience but who have some basic factory training with Ordinary National Certificate OR a sound knowledge of costing and wish to be trained for Works Management should also apply.

All applicants for both vacancies should be between the ages of 23 and 30.

Superannuation Scheme, full training and first class salary to the right person.

Applicants should state their age and give full details of education, previous positions held, salaries earned, etc. All information will be treated in strict confidence and the starting salary will commensurate with age, experience and qualifications. Write Box A.881, care of Central News Ltd., Pemberton House, East Harding St., E.C.4.

250-26

EXPERIENCED Technical/Sales Representative required, aged 28/35, to sell p.v.c. film to the packaging industry and industrial p.v.c. film users in Lancashire, Yorkshire and Northern Counties. Experience with p.v.c. film, polythene or other protective films an advantage. Appointment is within a division of group of companies. Substantial salary, expenses, pension scheme, car. Apply with fullest details of experience to Sales Manager. Box P505, care of " Plastics." 250-3

Situations Vacant (contd.)

Applications are invited for the position of Chief Chemist to a company producing thermosetting plastics at a factory in the North-West of England. Candidates should possess a good honours degree and preferably have had experience in the development and production of plastics materials and products. Salary will depend on qualifications, experience and age, but will not be less than £1,350 p.a. A contributory pension scheme is in operation and assistance will be given with housing if required. Applications in strict confidence to Box P5016, care of " Plastics." 250-30

WORKS OR PRODUCTION MANAGER required with wide experience on production of articles from natural and synthetic rubbers. This is a senior post carrying a high salary and only men with considerable experience need apply. Box P4919, care of " Plastics." 250-1370

WE REQUIRE an experienced and energetic man to take charge of our Injection Moulding Shop. Must be capable of obtaining highest possible output from both man and machine. Permanent and well paid position to the right man. Apply with full details of experience, age and salary required. Seaforth, Watchett Works, Oakhurst Rd., Southend-on-Sea. 250-1363

WORKS MANAGER required for injection moulding for South-West London. Moulding shop, toolroom and over 100 assemblers and packers. Experience in method study and other plastic fields a recommendation. Good conditions, pension scheme. When replying please state experience and salary required. Box P504, care of " Plastics." 250-4

RUBBER IMPROVEMENT LTD., WELLINGBOROUGH

require Process Control Technologists of A.P.I. or equivalent standard for their Plastics Division. This appointment is superannuable and applications giving fullest particulars, including age, education, qualifications, appointments held, date available to commence and salary required, to be sent in confidence to the Secretary. 250-16

CHEMIDUS PLASTICS LTD., Croydon (subsidiary of H. J. Enthoven & Sons, Ltd.), manufacturers of rigid non-plasticized p.v.c. tubes and pipes require Chief Executive. Applicants should have commercial experience in either the plastics or the pipe industry, and technical knowledge of p.v.c. would be an advantage. Aged 35–45. Salary not less than £2,000 p.a. Write to the Secretary, H. J. Enthoven & Sons, Ltd., Dominion Buildings, South Place, London, E.C.2. 250-16

Situations Vacant (contd.)

DESIGN AND DEVELOPMENT ENGINEER

required for the manufacture of Hydraulic Presses being produced in our factory under licence agreement with H.P.M. of America.

Successful applicants will be responsible for technical matters in connection with design, manufacture and sales. A knowledge of plastics and pressure die casting would be desirable.

Attractive pension scheme.

Applications giving full details of education, experience and age should be addressed in confidence to:—

THE SECRETARY,
CRAVENS, LTD.,
DARNALL, SHEFFIELD, 9.

250-19

SITUATIONS WANTED

PLASTICS TECHNICIAN seeks executive position with progressive company, preferably in or near London. British, aged 37. Returned 10-year administrative position Argentine. Fluent Spanish—comprehensive knowledge South America. Fifteen years experience compression, transfer, injection and extrusion moulding. Vacuum forming, high vacuum metalising, polyethylene blown bottles, etc. Expert mould/machine tool designer. Box P509, care of " Plastics." 250-x8160

TECHNOLOGIST (29), having thorough technical training and extensive laboratory and works experience in the thermoplastics field, seeks commercial or production appointment with really progressive company in Southern England where initiative and enthusiasm are valued and rewarded accordingly. Box P5012, care of " Plastics." 250-x8725

TIME RECORDERS

FACTORY TIME RECORDERS. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., Ltd., 157–159 Borough High St., S.E.1. 257-1206

WATER COOLING EQUIPMENT

DON'T DRAIN YOUR PROFITS. Save approximately 98% of your water. Instal a " SILENT FALLS " recirculating water cooler. Constant pressure at controlled temperatures. Details from makers. Mechanical Kold Ltd., 411 West Green Rd., Tottenham, N.15. Bowes Park 9635. zzz-182

CLASSIFIED ADVERTISEMENT ORDER FORM

Plastics BOWLING GREEN LANE, LONDON, E.C.1

PLEASE INSERT THE FOLLOWING ADVERTISEMENT IN THE NEXT.....ISSUE/S UNDER THE HEADING OF.....

Rate 6d. per word (minimum 12 words 6/-) ● Box Numbers: allow 4 extra words plus 1/- registration fee.

						Min.
						6/-
6/6	7/0	7/6	8/0	8/6	9/0	
9/6	10/0	10/6	11/0	11/6	12/0	
12/6	13/0	13/6	14/0	14/6	15/0	
15/6	16/0	16/6	17/0	17/6	18/0	

★ *Please use BLOCK letters throughout. Name and Address if to be used in the advertisement must be included above and paid for.*

PRESS DAY—Classified advertisements for the August issue must be received at Head Office by first post July 28.

REMITTANCE ENCLOSED FOR...../.....

Remittances should be crossed and made payable to TEMPLE PRESS LTD.

NAME: _____

ADDRESS: _____

_____

SIGNATURE: _____

PERSPEX
Fabrications, Mouldings, Blowing, etc.
Specialists to the Engineering & Allied Trades.
Exterior, Interior, & Illuminated Signs.
Machine Engraving.

Stockists of

PERSPEX - DARVIC - COBEX
BEXOID - TRAFFOLYTE

Milton Engineering Co. Ltd

CLARENDON ROAD, **HYDE**, CHESHIRE. *Tel.* HYDE 2091

INDEX TO ADVERTISERS

Name	Page
A	
Aerospray Associated, Ltd.	84
Allen, Edgar, & Co., Ltd.	64
Armstrong Patents Co., Ltd.	92
Arpal (Engineers), Ltd.	94
Associated Lead Manufacturers, Ltd.	85
B	
Bakelite, Ltd.	56
Ball, W. W., & Sons, Ltd.	65
Barber & Duffy, Ltd.	89
Bastian & Allen, Ltd.	94
Beck Koller & Co. (England), Ltd.	40
Berk, F. W., & Co., Ltd.	21
B.I.P. Chemicals, Ltd.	33
Birkbys, Ltd.	46
Blagden, Victor, & Co.	72
Blythe Colour Works, Ltd.	Inside Back Cover
Bone Bros., Ltd.	4
Boston Marine & General Engineering Co., Ltd.	82
Brand, Ed., Ltd.	53, 62
Bren Manufacturing Co.	69
Bridge, David, & Co., Ltd.	1
British Geon, Ltd.	43
British Resin Products, Ltd.	36, 37
British Rototherm Co., Ltd., The	94
British Titan Products Co., Ltd.	5
Burtonwood Engineering Co., Ltd.	35
BX Plastics, Ltd.	31
C	
Castle, John, & Co., Ltd.	94
Cellgrave Co., Ltd.	93
Coldwell, W. B., & Sons, Ltd.	94
Colt Ventilation, Ltd.	81
Commercial Plastics, Ltd.	49
Connor, Herbert, Ltd.	96
Courtaulds, Ltd.	59
Coventry Motor & Sundries Co., Ltd.	63
D	
Dale, John, Ltd.	44
Daleman, Richard, Ltd.	88
Desouter Bros., Ltd.	48
Drayton Regulator & Instrument Co., Ltd.	10
Dubuit, Ltd.	95
Dunlop Rubber Co., Ltd.	17
Durable Plastics, Ltd.	95
Durham Raw Materials, Ltd.	92
E	
Ebonestos Industries, Ltd.	52
Ekco Electronics, Ltd.	72
Elco Plastics, Ltd.	7
Emery, R. J., & Co.	92
Erinoid, Ltd.	Inside Front Cover, 8, 9
Evans, Frederick W., Ltd.	96
F	
Ferguson, James, & Sons, Ltd.	34
Fibre Form, Ltd.	12
Fibreglass, Ltd.	28
Fibrenyle, Ltd.	74
Foster Instrument Co., Ltd.	78
G	
Geigy Co., Ltd., The	61
General Electric Co., Ltd., The	58
General Engineering Co. (Radcliffe), Ltd.	32
Graviner Manufacturing Co., Ltd.	83
Guest Keen & Nettlefolds (Midlands), Ltd.	29
G.W.B. Furnaces, Ltd.	71
H	
Halex	27
Harvey, G. A., & Co. (London), Ltd.	91
Hayes Engineers (Leeds), Ltd.	89
Herbert, Alfred, Ltd.	75
H.F. Industrial Services, Ltd.	68
Holmes (Preston), Ltd.	78
I	
Iddon Bros., Ltd.	42
Imperial Chemical Industries Ltd., Plastics Division	Front Cover
Industrial Infra-Red, Ltd.	80
Injection Moulders, Ltd.	50
Insulation Manufacturing Co. (Plastics), Ltd.	80
Insulators, Ltd.	38
International Combustion, Ltd.	15
International Corporation, Ltd.	96
Iridon, Ltd.	49
Islington Metal & Plating Works, Ltd., The	86
J	
J.R.H. Products & Co., Ltd.	73
K	
Kent Mouldings	83
Kenure, J. F., Ltd.	85
Ketch, F. A., & Son Ltd.	94
King, Geo. W., Ltd.	23
Kodak, Ltd.	84
L	
London & Scandinavian Metallurgical Co., Ltd.	47
Ly-Bak, Ltd.	92
M	
M.C.M. Tools, Ltd.	90
Melwood Thermoplastics, Ltd.	70
Mersey White Lead Co., Ltd., The	96
Metropolitan Plastics, Ltd.	19
Micanite & Insulators Co., Ltd., The	55
Midhage, Jack, & Co., Ltd.	90
Miller, P. & L., Ltd.	70
Milton Engineering Co., Ltd.	100
Monsanto Chemicals, Ltd.	16, 60
Morton Machine Co., Ltd.	87
N	
Nash, J. W., & Co., Ltd.	96
Negri Bossi & Co.	30
O	
Omega Plastics, Ltd.	68
P	
Patent Lightning Crusher Co., Ltd., The	84
Peco Machinery Sales (Westminster), Ltd.	3
Petrochemicals, Ltd.	18
Piece Parts & Assemblies	76
Precision Screw & Manufacturing Co., Ltd., The	88
Pressoturn, Ltd.	67
Prices (Bromborough), Ltd.	13
Punfield & Barstow (Mouldings), Ltd.	Back Cover
R	
Reliance Trading Co.	88
S	
Saro Laminated Wood Products, Ltd.	11
Scott Bader & Co., Ltd.	79
Shaw, Francis, & Co., Ltd.	24, 25
Shell Chemicals Co., Ltd.	14
Sifam Electrical Instrument Co. Ltd.	86
Simmonds Aerocessories, Ltd.	54
Spa Plastics	90
Stamgo Manufacturing Co., Ltd.	96
Stevens, Michael S., Ltd.	90
Stone, J., & Co. (Deptford), Ltd.	41
Styrene Products, Ltd.	8, 9
Suntex Safety Glass Industries, Ltd.	90
Synthite, Ltd.	39
T	
Tant, W. H., & Co., Ltd.	76
Tensile Products, Ltd.	86
Textile Paper Tube Co., Ltd., The	93
Thermo-Plastics, Ltd.	22
Thomson & Joseph, Ltd.	88
Tullis Russell & Co., Ltd.	51
Tyler, E. W. & Co., Ltd.	82
U	
U.K. Plastics, Ltd.	74
United Coke & Chemicals Co.	66
Universal Tools, Ltd.	20
Utilex, Ltd.	87
V	
Vacuum Industrial Applications, Ltd.	91
Vinatex, Ltd.	2
W	
Welding Engineers, Ltd., Geneva	45
Welwyn Tool Co., Ltd.	92
West Instrument, Ltd.	26
Whiffen & Sons, Ltd.	77
Windsor, R. H., Ltd.	6

Published Monthly by the Proprietors, TEMPLE PRESS LTD., BOWLING GREEN LANE, LONDON, E.C.1, and printed in England by SIR JOSEPH CAUSTON & SONS, LTD., Eastleigh.

Annual subscription rate 44/- (Canada and U.S.A. $6.50). Shorter periods pro rata. Registered for transmission to Canada and Newfoundland by magazine post. Entered as second-class matter at the Post Office, New York, N.Y.

AGENTS ABROAD—EUROPE—Messageries Dawson (S.A.), Paris: Messageries Hachette et Cie, Paris; W. H. Smith & Son, Paris and Brussels. Canada—Wm. Dawson Subscription Service, Ltd., Toronto; Gordon & Gotch Ltd., Toronto. U.S.A.—Eastern News Co., 306 West 11th Street, New York 14, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; W. Dawson & Son (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190. Bombay. AUSTRALIA and NEW ZEALAND —Gordon & Gotch (A'sia), Ltd.

Blythe
PERMANENT COLOURS
for
PLASTICS
Blythe
COLOUR WORKS LTD
CRESSWELL, STOKE-ON-TRENT
Telephone: Blythe Bridge 2101
THE HOME OF THE
WORLD'S BEST COLOURS

Vol. XXIII. No. 250 **Plastics** JULY, 1958

Awaiting all comers...

P&B
INJECTION MOULDING
Specialists

No challenge is too difficult. If you have a problem in any thermo-plastic material, injection moulding can supply the answer, particularly Punfield and Barstow Injection Moulding.

PUNFIELD & BARSTOW
(MOULDINGS) LTD.
BASIL WORKS, WESTMORELAND RD. QUEENSBURY, LONDON, N.W.9

Tel: COLINDALE 2266/7/8 *Grams:* PUNFIBARS, HYDE, LONDON

W

RY,

ON